PUBLICATION OFFICES:
168-177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York.

W. J. JOHNSTON, Editor and Publisher.
T. COMMERFORD MARTIN, JOSEPH WETZLER, } Associate Editors.
G. H. STOCKBRIDGE, Assoc. Editor Patent Department.
CLARENCE E. STUMP, Business Manager.
WALTER T. HUNT, Advertising Dept.

New England Office, 48 Congress Street, Boston.
W. I. BARKER, Manager.
Western Office, 44 Lakeside Building, Chicago.
W. A. KREIDLER, Manager.

SUBSCRIPTION, IN ADVANCE, ONE YEAR, $3.
(Postage Prepaid in the U. S. or Canada.)
CLUBS.—In clubs of 4 or more, $2.50 a year each; with a free extra copy to the getter-up of a club of 8.
Subscription to foreign countries, $4 a year.
In requesting your address changed, give old as well as new address.

THE ELECTRICAL WORLD
HAS THE LARGEST CIRCULATION
OF ANY ELECTRICAL JOURNAL PUBLISHED, AND IS
THE BEST ADVERTISING MEDIUM.

Advertising Rates are much lower than those of any other similar publication, circulation and standing considered, and vary according to space, position and number of insertions. Quotations promptly furnished on application covering these points.
Notices of Situations or Help Wanted, $1 to $2 an issue.

Correspondence, views and opinions on all topics within the province of this journal are cordially invited from any part of the world. We will thank readers to forward to us—promptly as they occur—Items of News, or information relating to any application of Electricity, also marked copies of their local papers containing anything likely to interest electricians. Anonymous communications cannot be noticed, nor can rejected manuscript be returned, unless accompanied by the necessary postage when received.
Matter for the Editorial Department should be addressed to
The Editor of The Electrical World, New York.
Subscriptions and communications relating to Advertising or the Business Department should be addressed to
W. J. JOHNSTON, Publisher,
Potter Building, New York,
OR EITHER OF THE BRANCH OFFICES.

CONTENTS.

ILLUSTRATED ARTICLES: PAGE.
To Determine Graphically the External Characteristic of a Shunt-wound Dynamo ... 116
The Predetermination of the Characteristics of Dynamos ... 116
Duplex Telephony ... 116
The Bickford Electric Train Signal System. ... 117
Some Practical Questions in Magnetism ... 118
Improvements in Fire Alarm and Police Telegraphs ... 119
Ries' System of Electric Brakes ... 120
The Elgin Mechanical Telephone ... 121
Driving Dynamos ... 121

NEW BOOKS:
"L'Année Electrique" ... 116

CORRESPONDENCE:
The Partz Acid Gravity Battery ... 122
The Effect of Atmospheric Electricity on Telephones. 122

EDITORIAL PARAGRAPHS ... 115

MISCELLANEOUS: PAGE.
New Applications of Electricity ... 116
The Employment of Spiral Springs for Measuring Instruments ... 117
A Swedish Telephone Palace ... 117
An Automatic Target Indicator ... 118
New Method of Making Battery Plates ... 121
Probing by Electricity ... 121

DEPARTMENTS:
New York Notes ... 122
New England Notes ... 123
Philadelphia Notes ... 123
Pennsylvania Notes ... 124
Western Notes ... 124
The Telegraph ... 124
The Telephone ... 125
The Electric Light ... 125
Applications of Power ... 125
Miscellaneous Notes ... 126
Personals ... 126
Stock Quotations ... 126
Business Notices ... 126
Our Illustrated Record of Electrical Patents ... 126

New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

PAGE.
Munson & Co.—Eagle and Dynamo Electric Light Belting ... iii
Gill & Murray—Electric Light Globes and Shades ... iv
The United States Electrical Co.—The Electric Light Radiator, Electrical Apparatus and Supplies ... vi
Edw. P. Allis & Co.—Reynolds' Improved Corliss Engines ... vii
Otto Flemming.—Electro-Medical Batteries ... vii
Charles S. Crossman.—Watches ... vii
Electric Time Co.—Electrical Time System ... vii
E. A. Wildt & Co.—Bells, Annunciators and Door Openers ... vii
The Electrical Supply Co.—The Wirt Voltmeter, General Electrical Supplies ... xii
Globe Iron and Electrical Engineering Works.—Electrical Appliances ... xiii
Viaduct Manufacturing Co. ... ii, iii, vi, vii, viii, ix, xi, xiii, xv, xvii
Edwards & Co.—Electric Door Openers ... xix
Want and For Sale Advertisements ... xi

Vol. IX. NEW YORK, MARCH 5, 1887. No. 10.

IT is plain that the authorities of the church who opposed the introduction of the electric light into the sacred edifices of Italy, on the ground that it was sacrilegious, have changed their minds. As noted in another column, the beautiful cathedral at Milan is now lighted by electricity, and the results have been so satisfactory that probably many other Italian cathedrals and large churches will soon have the same illumination. Another incident, highly significant of the triumph of the electric light, is that it is being extensively installed in the royal palaces of England. When Queen Victoria will have no other light, her loyal subjects will be quick to follow her initiative, and her opinion on the subject is to be seen in the work now going on at Windsor and elsewhere.

IT is said that the farmers in Alameda County, California, have been greatly troubled by the flocks of birds that devastate their crops nightly, and that they have found a remedy in burning candles all over the fields. These candles, however, require constant attention, and have to be carefully protected against the wind by sacks. Here, evidently, is a good chance for a new application of the electric light. A small, cheap dynamo, driven by steam or by water power, would run an arc light or a few incandescents, and, while affording ample protection, would call for no anxious watching or skillful trimming, or fencing with sacks. It could also be utilized in other farm work.

A CORRESPONDENT draws attention in another column to a phenomenon observed in a telephone, and asks the question whether it could have been caused by the electrical conditions of the atmosphere. The manifestation was followed by a change in the state of the weather a few hours afterwards. This was probably the true cause, and we think the time is not far distant when the telephone will occupy a very prominent part in weather observations and forecasts. The changes in earth current strength and the electrical conditions of the atmosphere have not yet been studied sufficiently long to permit of the results being definitely interpreted; but enough has been shown to point to the fact that when sufficient material has been gathered, certain laws will be developed which will add greatly to the scope and value of weather prediction.

THE use of electrical measuring instruments in which springs are employed has given rise to some controversy regarding their reliability. It is of value, therefore, to have the results, as to their accuracy, of tests on the reliability of springs with prolonged use, such as those given in another column, and determined by Kohlrausch. From these results, it would appear that the spring maintains a tolerably constant force when properly made, and, judging from past experience, it far exceeds the permanent magnet instruments in constancy. There is a great demand for cheap and reliable instruments for measuring currents, but we think that probably the instrument of the future will contain neither spring nor permanent magnet, and that the force of gravity will be the one that opposes the action of the current. Several such instruments have already been constructed, but the best form is still to be sought, and we call the attention of our readers to the demand and to the need of finding the best method of its fulfillment.

THE various recent discussions of the electric motor question have already been remarkably beneficial. They have arrested attention on the fact that the motor is to-day a practical, efficient and economical machine, and they have led many people to consider their use who but a month or two ago had not the least idea that there was any such useful apparatus in existence. We speak on this point with full knowledge, having been ourselves applied to by a number of power users—principally printers—for information as to the manner in which they could avail themselves of the electric motor. On inquiry we find that most of them had not, until the present year, entertained any idea that their special necessities could be met by electricity, but having now satisfied themselves from what they had heard and seen, they were anxious to get the services of a power so cheap, handy and docile. We have ourselves spoken with a great many users of electric motors, and have yet to meet the man who did not prefer them to anything else he had tried.

AT last, with its affairs so snarled up by legal complications that it is impossible to declare just what can or can not be done, the New York Subway Commission has "called a halt." Its employé, the Subway Company, has been instructed to suspend work until some definite point is reached in the way of settling the powers and constitutionality of the Commission. Just how soon that point can be arrived at nobody knows. Several bills to break the deadlock and take a new departure are before the Legislature, but they are pushed by opposing interests, and it is not easy to say which is likely to be passed. The course of events, from the first, has been such as to render capitalists shy of investing in New York subway construction, and though there is more than one company now prepared to go on with the work, this last stoppage is not the best thing that could have happened for them. In some quarters it is thought not improbable that the new subways will be made a branch of the Public Works department. That being so, it is to be regretted that all done hitherto has been by other and private parties. Such an arrangement would also, if logically carried out, throw on the city the cost of constructing the subways. This is a very serious consideration for the taxpayers.

WE have been very glad indeed to see the unanimity with which the press of the country, impelled by the recent sad railway accidents, has called for the substitution of electricity in the place of all other agents for railway car lighting. We have also been glad to note the readiness with which the more progressive roads have responded to what is unquestionably the general public sentiment on this question. Train-lighting by the use of electricity is feasible from whatever standpoint it may be regarded, and the introduction of this method, though it has been tardy, will now go on briskly. One reason of the delay, perhaps, has been the scepticism with regard to the availability of the storage battery, but that doubt is now, we think, put to rest, once and for all, in the minds of those who are not prejudiced or biased, and who have carefully studied the growth in this field during the last two years. At any rate, the change of front has come, and to-day we find several railroads equipping for the electric light. In some instances, as in that of the Northern Pacific, the current is to be generated on a separate car, and, it would appear, used as made, but in the majority of cases the storage battery will have to do the work. Here comes in the question of charging. This is not now readily dealt with, but as stations become more generally lighted by electricity it will fall into minor importance. Besides, there is no fundamental reason why a train should have its storage batteries charged only at the termini between which the train runs. Other ways of eminent practicability suggest themselves, and will, no doubt, be resorted to.

THE suits now pending in this country in relation to the manufacture of incandescent lamps have not yet come to a hearing in open court, and hence the public interest in them has somewhat abated. In England, however, similar suits have now been pushed so far that the Court of Appeals has given a decision which leaves as a last resort only an appeal to the House of Lords. We mentioned this recently on receipt of a special cable dispatch. The case in question was a suit for infringement instituted by the Edison & Swan United Electric Light Company *vs.* Woodhouse & Rawson. In May of last year Mr. Justice Butt decided that the patent of the plaintiffs was valid and had been infringed by the defendants. Upon appeal, this judgment has been affirmed by two Lord Justices, Fry and Bowen, and hence the Edison patents are still valid in England. One of the Lord Justices, Cotton, dissents, however, from the others. In reviewing the long judgments given it is evident that the principal point at issue was the definition of the word "filament." While the affirming justices admit that several of the elements disclosed in Mr. Edison's invention were known and described in the patents of King, Roberts, Lane-Fox, Swan and others, they say that all lacked the qualities essential to insure the success that has been attained by the Edison lamp. As regards the argument that Mr. Edison, in his specification, gives no definition of a filament, and has nowhere drawn the line between it and a rod, the judges assert that in a patent of that description definition is required only to such an extent as would enable a practical workman to construct the required apparatus; further, that there is distinct evidence that such a workman could make the required apparatus from the specification; that no witness of the defendants alleged that such workman would have any difficulty, or would require any further experiments, and that the specification itself contains descriptions of six forms of filament, which would afford material assistance to any workman in doubt. It was the filament, the judges claim, which by replacing the older carbon rod, in combination with the other elements, converted failure into success. They admit that the mere change in the size of the part of the combination cannot ordinarily form the proper subject of a patent; but they contend that in this case the substitution of the filament for the rod brought about a result which the rod could never produce. As a further proof of the novelty and usefulness of the invention they cite the fact that whereas before November, 1879, two or three experimental lamps were all that had been produced, after that date tens of thousands were made, and form the basis of successful incandescent lighting. The dissenting Lord Justice Cotton differs from his associates principally on the question of the construction of the specification, which he holds to be vague and indefinite. He contends that there is nothing in it which requires flexibility or resilience in the filament. He sees also in the Swan lamp an actual anticipation of Edison's second and principal claim. Messrs. Woodhouse & Rawson contended that the elements embodied in the Edison patent being old, it should only be limited to the details of manufacture, and as they made their filaments by a process different from that described in the specification they did not infringe. It is evident that the judges in the affirmative did not attempt to give a definition of the word "filament" in its legal limitations, so that that question seems still open to discussion. Basing his view of the case upon their wording, therefore, Mr. Alex. Bernstein claims that he is perfectly free to make incandescent lamps of his design. It was conceded by the judges, he contends, that the Swan lamp was a failure, because the carbon was too thick, and that by the introduction of the *filament* the Edison lamp became a success. The Swan carbon, which in the judgment is called a carbon, was $\frac{1}{32}$ of an inch in diameter. The carbons which Mr. Bernstein uses in his lamps have a diameter of $\frac{1}{64}$ of an inch. Hence, he claims, this settles the question of his right to make his lamp.

NEW BOOKS.

L'ANNEE ELECTRIQUE. By Ph. Delahaye. Paris, Baudry & Co. 1887. 880 pp.

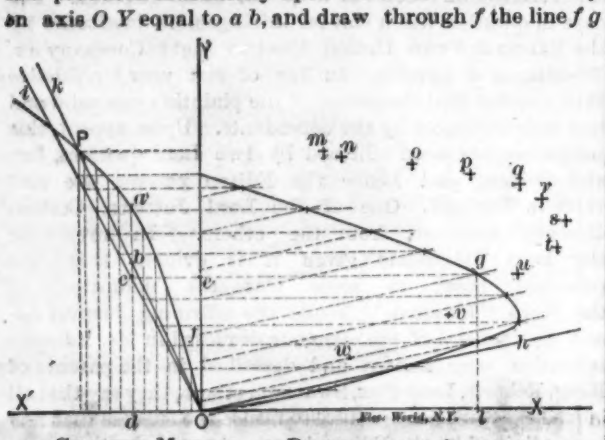
This is the third year of the appearance of the electrical annual by M. Delahaye, and the plan pursued by him is the same as in the previous editions. He has undertaken to give a concise and connected record of the past year's work in electrical science and the arts, and has thus embodied in a convenient form what is scattered through a large number of periodicals. We think the annual could be enhanced in value by the addition of illustrations and references to the original source of information where more details could be found than can be given in the review under notice.

To Determine Graphically the External Characteristic of a Shunt Wound Dynamo.

BY W. M. SCHLESINGER.

Let $O\,P$ be the curve of magnetization; tan $i\,O\,X$ the resistance of the field-magnets, the current in these coils being measured along $O\,X'$; let tan $h\,O\,X$ be the resistance of the armature; and tan $h\,O\,X'$ = tan $i\,O\,X'$ + tan $h\,O\,X$ = the resistance of field-magnets and armature.

Then the ordinates of the curve $P\,O$ will represent the internal or total E. M. F. for varying currents; the ordinates of line $i\,O$ the corresponding external E. M. F.; and the difference between the ordinates of line $k\,O$ and $i\,O$ will represent the E. M. F. necessary to drive the current required for the magnets through the armature resistance. To construct the external characteristic, let fall from a, a point on the curve $O\,P$, a perpendicular $a\,d$ to the axis $O\,X'$. From point c, where this perpendicular intersects line $i\,O$, draw a line parallel to $O\,X'$, cutting the axis $O\,Y$, and produced indefinitely upon the other side. Make $e\,f$ on axis $O\,Y$ equal to $a\,b$, and draw through f the line $f\,g$



GRAPHIC METHOD OF DETERMINING CURVE OF MAGNETISM.

parallel to line $O\,h$. Then g will be a point on the external characteristic.

The following is the proof: Let C' be the current in the external circuit; C'' the current in the magnet coils; r the resistance of the armature; R the resistance of the shunt; and E the total (internal) E. M. F.; then

$$C' = \frac{E - C''(r + R)}{r}; \text{ or,}$$

$$C' = \frac{a\,d - O\,d\,(\tan h\,O\,X + \tan i\,O\,X')}{\tan h\,O\,X} =$$

$$\frac{a\,d - O\,d \tan k\,O\,X'}{\tan h\,O\,X}; \text{ or,}$$

$$C' = \frac{a\,b}{\tan h\,O\,X} = \frac{e\,f}{\tan e\,g\,f} = e\,g\text{; and as}$$

$g\,l$ is equal to $c\,d$, or equal to the external E. M. F., g is a point on the external characteristic corresponding to a on the curve.

Points m, n, o, p, q, r, s, t, u, v, w and O are points on the corresponding internal characteristic beginning at O and ending at m.

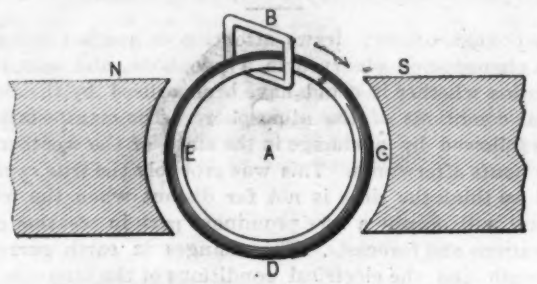
New Applications of Electricity.

We are so accustomed to the increasing use of electricity in nearly every phase wherein we live, move, and have our being, that but little notice is taken of these new applications until our notice is called to some act so radically novel that it arrests attention. One of the first uses of the telephone was to summon physicians, and more or less definite hygienic instructions have been given in reply, but the Atlantic cable has probably been the first to be used for the transmission of prescriptions and treatment for a patient. A lady from New York, says *Engineering*, while traveling on the Continent, was taken ill of a fever in a German town, and her relatives, being distrustful of the medical attendance, cabled every day to the family physician in New York, and received in turn detailed instructions both as to medicine and treatment. The case at one time became so serious that the home physician called in some of his colleagues for consultation. This treatment was kept up for several weeks, and the fair patient recovered and returned to her home early in October. The other case was that of the aged father of a millionaire merchant of New York, who was taken ill when in England, and bulletins of the patient's condition were daily cabled to family physicians at the office of his son in New York, and the results of the treatment, telegraphed in return, were of the most successful nature. Apart from the advantage which a family physician may possess, owing to a knowledge of physical habit and hereditary tendencies, there can be no marked difference in the therapeutic value of skilled medical attendance in any part of the civilized globe, but mentality exerts such a strong influence in disease that a stranger in a strange land would undoubtedly feel an assurance of returning health by a knowledge that his treatment was prescribed by the skill of his trusted physician at home.

The Predetermination of the Characteristics of Dynamos.

BY F. S.

In the paper entitled as above, by Mr. Gisbert Kapp, which appeared in THE ELECTRICAL WORLD of Dec. 4, 1886, there is given this equation for the E. M. F. of the



DETERMINING DYNAMO CHARACTERISTICS.

armature, viz., $E_a = z_1\,N\,t\,n\,10^{-8}$, the unit line being taken equal to 6,000 C. G. S. units.

Let A [see accompanying figure] represent a Gramme ring rotating between poles N and S, and let B represent one coil of wire on the ring. Now, the electromotive force will be the number of lines added to or subtracted from the coil in one unit of time. Suppose the coil to be at the neutral point B, and hence embracing all lines in one-half of the ring. The E. M. F. produced in passing from B to C will be represented by $\frac{1}{2}\,Z_1$, for one-half the whole number of lines will have been substracted. The same will be true from C to D, and, in fact, for all four quadrants, so that the E. M. F. for one revolution, if produced in one second of time, will be $E_a = 2Z_1$ in C. G. S. units. If the speed be n turns per minute, $E_a = \frac{2\,Z_1\,n}{60}$, and if the armature contains $N\,t$ turns of wire E_a becomes $\frac{2Z_1\,n\,N\,t}{60}$, but as the unit line in the article referred to is equal to 6,000 C. G. S. units, we must multiply by this, and it becomes $E_a = \frac{2Z_1\,n\,N\,t \times 6{,}000}{60}$.

To reduce this to volts it must be divided by 10^8, as one volt is equal to 10^8 C. G. S. units. Making the multiplication, we get for E_a the following value:

$$E_a = \frac{2\,Z_1 n\,N\,t \times 6000}{60 \times 10^8}; \text{ or,}$$

$$E_a = 2\,Z_1\,n\,N\,t\,10^{-6}.$$

I can see no fault with my work. Yet in the article by Mr. Kapp, referred to above, the value of E_a is just one-half of the value obtained by me. I should be obliged if any of your readers can point out the fault in my calculation, if any exists.

Duplex Telephony.*

BY DR. A. M. ROSEBRUGH.

When I took up this question a little over two years ago my object was to use the metallic circuit or double wire trunk line system connecting two telephone exchanges so

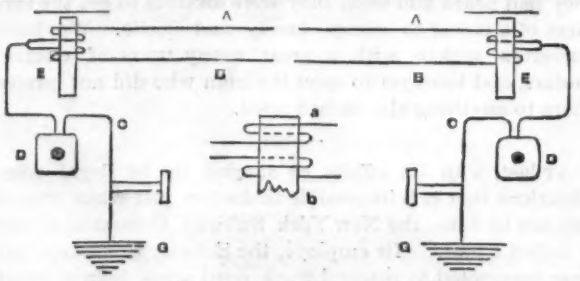


FIG. 1.—DUPLEXING TELEPHONE LINES.

that either two telephone subscribers or a telephone subscriber and a central office operator at each end of the metallic circuit could communicate simultaneously without interference. In order to accomplish this I found that there were two problems to solve, firstly, how to render the central office receiving telephones neutral to the subscribers' transmitters, and secondly, how to render the subscribers' receivers neutral or irresponsive to the central office transmitters.

The solution of the first problem was not attended with any great difficulty. The plan adopted was as follows, namely: At each central office and at each end of the metallic circuit a subscriber's line was attached. Instead of using the ordinary telephone receiver with a single coil, a telephone with a double coil was used, and instead of inserting that coil in a single branch of the metallic circuit, one coil was inserted in one branch and the other coil in the other branch of the metallic circuit, and the connections were made so that electrical currents traversing one coil would be neutralized by the electrical currents traversing the other coil. Speaking technically, the coils were connected differentially. The electrical currents generated by the subscribers' transmitters passed through the two coils in opposite directions and consequently neutralized each other. Hence, while two subscribers, one at each end of the metallic circuit, were using the line, nothing would be heard in the central office telephones.

The first problem having been solved I was encouraged to attempt the solution of the second, namely, how to render the subscribers' telephones neutral to the central office transmitters. This was found to be a difficult problem. It was obvious that if the transmitters were placed in either branch of the metallic circuit, the electrical currents generated by the transmitters would divide at the junction of the subscribers' lines and a portion of the currents would escape to ground through the subscribers' telephones. Without stopping to enumerate the different expedients resorted to, I finally saw that the only solution to the problem was to arrange the central office transmitters so that both branches of the metallic circuit would be charged equally, simultaneously and in opposite directions. By charging one wire positively and the other negatively at the same time, I saw that the electrical equilibrium between the two wires could be disturbed without affecting the equilibrium of the subscribers' lines. Fortunately, after many and various experiments, the means for accomplishing this were discovered and the problem was finally solved.

I also discovered that this can be accomplished in several ways. I will call your attention to but two of these. The first of these methods is to use a transmitter with two induction coils, the primary coils being connected either in series or in multiple arc, and the secondary coils being

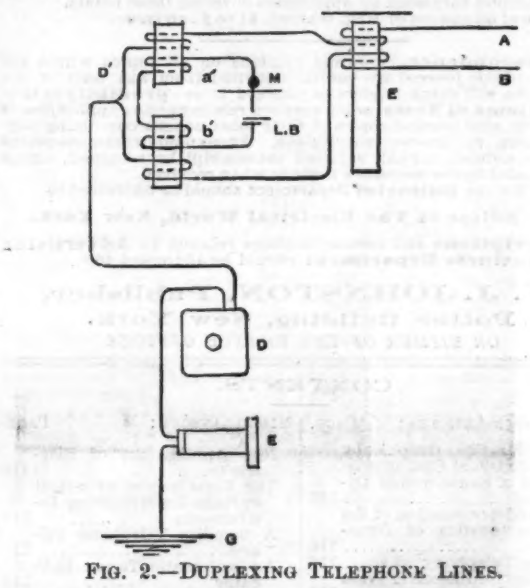


FIG. 2.—DUPLEXING TELEPHONE LINES.

connected in circuit, the one in one branch of the metallic circuit and the other in the other branch of the metallic circuit. In the second method repeating coils are used with one coil in each branch of the metallic circuit, the coils being connected with each other and also with an independent telephone circuit.

The arrangement of apparatus, according to the first method, is shown in Fig. 1. Here $A\,A$ and $B\,B$ are two branches of a metallic circuit, and $C\,C'$ are two subscribers' lines attached thereto. D and D' are subscribers' transmitters, and $E\,E$ are receiving telephones at two central offices at each end of the metallic circuit respectively. The telephones $E\,E$ have two coils, a and b, the former connected with wire A, and the latter with wire B. These coils are connected differentially, and the telephones are neutral to the subscribers' transmitters.

The operation of the system is as follows.: The voice impulse vibrates the diaphragm of the transmitter; this varies the strength of the local battery circuit traversing the primary coils of the two induction coils; this generates secondary currents in the two secondary coils, and this in turn generates electrical currents in the two branches of the metallic circuit. If the two coils are properly balanced, electrical impulses are generated in each branch of the metallic circuit equally and simultaneously, and if the connections are properly made, these electrical impulses traverse the metallic circuit in opposite directions, the currents generated in one coil being re-enforced by the currents generated in the other coil. Adjustable cores are used in connection with the two induction coils for the purpose of balancing, in case the two branches of the metallic circuit are not perfectly balanced.

I might mention here in passing that the converse is also true, namely, if the connection of one of the coils be reversed, the currents generated by one coil will be opposed by those of the other and no current will traverse the metallic circuit; the currents will meet, however, at the subscribers' lines, and, being re-enforced, will proceed to "ground" through the subscribers' telephones. Advantage may be taken of this fact and two sets of transmitters may be used at the central office or at any point in the metallic circuit, and they may be connected in such a manner that the subscribers' telephones will be responsive to one and neutral to the other.

Preferably, however, I would give the subscriber both a

* A paper read before the Canadian Institute.

return wire and a ground wire, and, preferably, two installations of telephonic apparatus, one a single installation for ordinary use and the other an installation of duplex apparatus for long-distance telephoning on the metallic circuit. This arrangement is shown in Fig. 2, where *A* and *B* are the two branches of a metallic circuit at one end of a telephone trunk line, *C* is a subscriber's line and *E* a receiving telephone in the subscriber's line. *D'* is a transmitter with two induction coils at the central office. The secondary coil of coil *a'* is in circuit with wire *A*, and the secondary coil of coil *b'* is in circuit with wire *B*. *M* is a microphone and *LB* the local battery connected with the primary coils of *a'* and *b'*. *E* is the differentially wound receiving telephone at the central office.

When repeating coils are used for charging the two branches of the metallic circuit, these branches are charged indirectly through the repeaters. I am aware that there is nothing new in using repeating coils in telephone circuits, but, so far as I am aware, they have never been used as here described, nor with the same object in view, namely, to actuate and to be actuated by both branches of a metallic circuit simultaneously. The advantage of using repeaters, as here indicated, is to enable two subscribers at each end of the metallic circuit to communicate simultaneously without interference, one subscriber using a line connecting directly with the metallic circuit, and the other subscriber using a line connecting indirectly by means of the two repeating coils. Hence, by a combination of these two methods, it will be seen that either two subscribers or one subscriber and a central office operator at each end of a metallic circuit may communicate simultaneously without interference.

One important advantage resulting from this arrangement remains to be named, namely, the subscribers have the advantage of two conductors instead of one. This reduces the resistance of the line one-half, and must necessarily very much improve the working of long-distance telephone lines. This idea may be extended as follows: Two metallic circuits may be connected at each end so as to form a third metallic circuit. This third metallic circuit may contain duplex central office telephonic apparatus and form a connection with a subscriber's line as well. This would give the subscriber the benefit of four conductors. The four trunk lines would be formed into three metallic circuits, and three repeating circuits could be used. In other words, the four wires would admit of four subscribers at each end of the line using the same wires simultaneously.

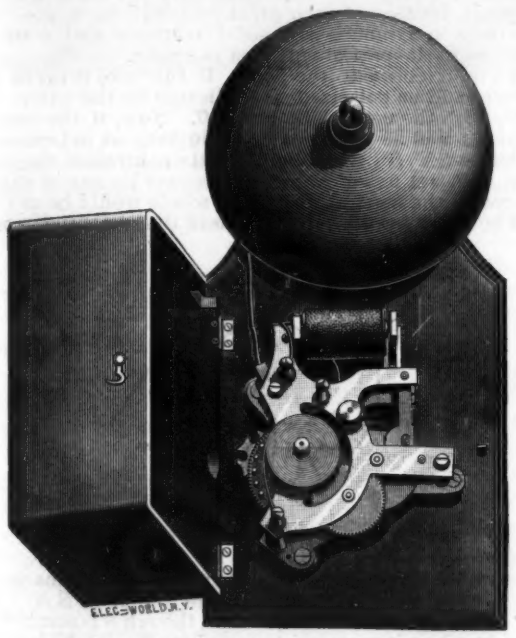


FIG. 1.—ELECTRO-MECHANICAL GONG.

The Bickford Electric Train Signal System.

For some time past several railroads in New England have had in operation the Bickford railway station indicator, which has already been described in THE ELECTRICAL WORLD, and to this Mr. John H. Bickford has now added a complete train signal system by which the passengers or trainmen can instantly signal to the engineer to stop in case of accident or any other cause.

The cars are wired, and a special coupling is provided to join the circuits together between the cars.

In experimenting to obtain the most practical apparatus, it was found to be inadvisable to put in the engineer's cab a bell which contained a spring to be wound, depending upon the engineer to wind it. Vibrating bells were next resorted to, but they could not be kept in adjustment, and, besides, they required an increased amount of battery to ring them and frequently gave false signals due to the violent jarring of the engine while running.

The form finally adopted was an electro-mechanical gong shown in perspective in Fig. 1. This bell is so arranged that it gives one decided signal for each pressure of the button in the car. The armature-lever is counterbalanced so that jarring and shaking does not affect it. At the same time it is so sensitive that only two cells of battery are required to operate it through an ordinary train.

In the construction of the bell an automatic winding device, shown detached in Fig. 2, is employed. This is so constructed that when the spring is fully wound the pawl is removed from the ratchet, allowing the winding lever to move freely as before, but so as not to affect the spring. Referring to the figure, it will be seen that a long hook-shaped pawl is attached to the winding lever, and engages the teeth of the ratchet when the lever is moved, but in its normal position is held out of engagement by a pin to permit of the rotation of the ratchet in the opposite direction. At the lower end of the pawl a curved finger is attached, which bears against a triangular-shaped piece, secured to

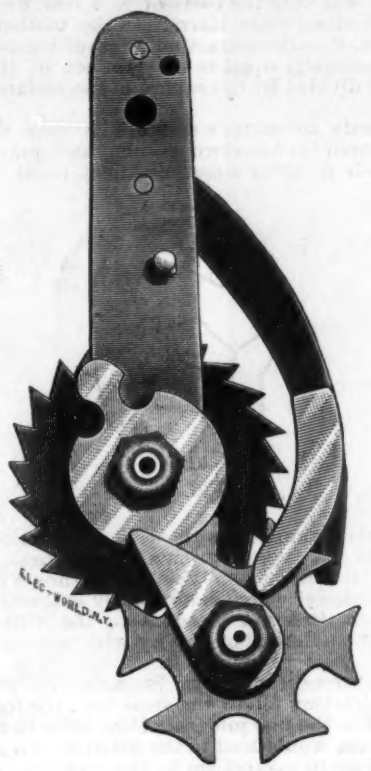


FIG. 2.—WINDING MECHANISM OF GONG.

the star wheel. On the same shaft with the ratchet is placed a small wheel with a projection. This projection engages the notches in the star wheel and forces the triangular-shaped piece against the curved finger, thus holding the pawl away from the ratchet during the whole movement of the winding lever.

The winding lever is attached by a cord or by a series of levers to any manually operated lever on the locomotive, such as the whistle lever, which is frequently used, and thus the spring is kept fully wound at all times. In order to give sufficient margin, in case the whistle is not used often, the bell is arranged to strike one hundred and fifteen times before it is fully run down.

The coupling employed to connect the cars of a train is shown in perspective in Fig. 3, and is so constructed as to completely protect the electrical contacts from the weather, smoke and steam. One-half of the coupling

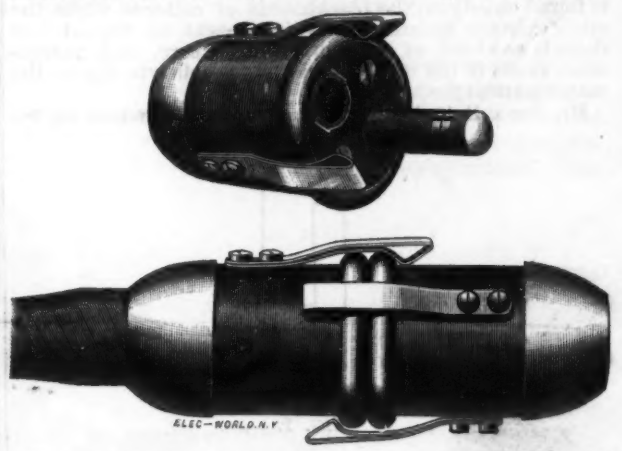
FIGS. 5, 6 AND 7.

showing the internal construction is seen detached in Fig. 4. As will be seen, the tube contains four springs, two each of which embrace the finger of the opposite half, thus insuring a perfect contact. The small pin shown at the left of the large finger controls a spring placed in the back part of the coupling, this spring serving to establish a connection between the tube and finger when the two halves are separated. In other words, it closes the circuit in the train, causing the bell to strike in the cab of the engine in case a car should become detached from the train accidentally.

The method of attaching the flexible cord to the wires inside the car is shown in Figs. 5, 6 and 7. The flanges on the sleeves are screwed to the outside of the car and the wire from the inside is brought out and soldered to them. The tips on the ends of the cable fit into the sleeves and lock with it. This is done for the sake of convenience in case some accident should happen to the coupling. In that case any trainman can put another in its place. The system is owned by the Bickford Railway Station Indicator Company, of Boston.

The Employment of Spiral Springs for Measuring Instruments.

In a paper by Prof. W. Kohlrausch, in the *Electrotechnische Zeitschrift*, on the employment of spiral springs for measuring instruments and the accuracy of galvanometers constructed therewith, the causes which are likely to affect the constancy of spiral springs are mentioned in detail by the author, with an account of experiments bearing on each point, in order to afford some idea of the reliance that can be placed on the indications of instruments into the construction of which they enter. The effect of age, judging by observations on a brass spring extending over a period of seven years, may be completely neglected. Continuous and prolonged deformation produces a small amount of permanent set, so that the spring when released does not return to the original position, but does not actually alter the indications of the instrument if the readings are taken from the new zero thus found; steel is in this case less affected than German silver. Oft repeated, but intermittent deformation—as exhibited by a spring of 90 convolutions and 2½ in. long, being stretched so as to change from a length of 3½ in. to 9 in. two hundred times per minute for four hundred minutes—introduced no appreciable alteration in its subsequent indications. An increase of temperature of 18 degrees Fahrenheit raised the indications of a Siemens torsion galvanometer about $\frac{1}{10}$ per cent., so that the reduction in the elasticity of the spring is apparently almost equal to the decrease in moment of the magnet, which would be, under these conditions, about 0.4 per cent. Further experiments on loaded springs confirmed this conclusion, and showed that steel was again to be preferred to German silver. By combining the results given above, the utmost limit of error introduced by the use of spiral springs cannot exceed 0.5 per cent. If, however, as is the case in the Siemens tension galvanometer, the current passes through the spiral spring, care must be taken that the heating from the passage of the current is not excessive. The author found an alteration of 1.4 per cent. in the indication of such an instrument after 30 minutes' continuous test, with a difference of potential of 100 volts between the terminals. If such instruments be calibrated at intervals to correct the decrease in the moment of the magnet, an accuracy within about 0.1 per cent. can be relied on. With the Siemens dynamometer for intense currents, the limit of error, owing to the friction at the mercury contacts, is about 1 per cent. Another form of instrument, the spring galvanometer of F. Kohlrausch, is also reliable within 1 per cent., and is perfectly aperiodic with frictionless damping. Owing, however, to the employment of an iron core, the readings of currents taken in ascending and descending order of magnitudes will vary to some considerable percentage from the effect of residual magnetism, which exists in even the best soft iron, if this error be not eliminated by mechanically bringing the core past the position it would take up under the action of the current, and then leaving it free to return to that position.



FIGS. 3 AND 4.—ELECTRIC CAR COUPLER FOR TRAIN SIGNALS.

A Swedish Telephone Palace.

There is propably no capital in Europe where the telephonic system has been brought into more general use than is the case in Stockholm, nor can any other European city vie with the Swedish capital as regards perfection of arrangements, etc. The plan adopted there, as in most Swedish towns, is a high degree of centralization, which simplifies the service and saves time and money. There are in Stockholm two independent companies, of which the Almänna Telephone Company seems to be taking the wind out of the sails of the Bell Company. The former has at present some 3,600 subscribers, a large number for a moderately-sized town like Stockholm; and when its new building is completed there will only be two stations or centres, of which the new building will accommodate 3,100 subscribers. The new building referred to has, not without cause, says *Engineering*, been christened a telephonic palace, as, with one or two minor exceptions, the whole of the large edifice, from cellar to top, is given up to the various departments of the company. The most interesting feature is undoubtedly the large telephone room, its length being 110 feet, with 80 feet breadth, which obtains its light partly through the ceiling and partly

through windows. It is at present intended for 4,000 subscribers, but can be increased up to 7,000 subscribers. These 4,000 are divided among twenty tables, with 200 subscribers "proper" for each table, but according to the new and ingenious, although somewhat complicated, arrangements, all the other subscribers can "call on" each table, where the connection can then be established without communicating with other tables. There is also a special signalling system, which shows when a subscriber is engaged at another table. All this necessitates 16,000—and, should the service be extended to 7,000, 28,000—connections at each table. The number of connections increases in proportion to the square of the number of subscribers, so that 7,000 subscribers require forty-nine times as many connections as 1,000. The staff of clerks in this room is two at each table, and, as there is a double set, the total is eighty clerks. The wires in the telephone room are arranged in net fashion, and the wires within the room will have the aggregate length of 160 Swedish miles.

Some Practical Questions in Magnetism.*

BY TOWNSEND WOLCOTT.

The mathematical theory of magnetism is a difficult subject, but on the other hand the treatment of practical questions in magnetism without mathematics is to my mind about as satisfactory as would be the attempt to navigate a ship or survey a piece of land under the same conditions.

It is neither necessary nor advisable that practical men should go very deep into mathematics, but they should be able to understand the results of mathematical reasoning. What may be done in this direction is shown by the number of practical seamen who learn navigation, which really requires some facility in the use of figures, in addition to being able to comprehend results. I am aware that both in magnetism and electricity there has been considerable controversy on this very point. Thus, Professor J. T. Sprague has said in the preface to his work that there are two kinds of electricity in the present day. One kind is found chiefly on the blackboards of colleges, while the other exists in nature. To which might be replied that there is one kind of magnetism in nature, and various other kinds in the minds of various people who ignore the mathematical theory.

Mr. Forée Bain has pointed out † the discrepancies between experiments and the statements of text-books, which discrepancies, I think, are chiefly due to misstatements of the mathematical theory of magnetism. Let us take, for instance, the statement he quotes: "If a magnet is broken into any number of pieces, every piece will be a complete magnet with poles of its own, equal in strength to the original magnet." Now if we had a magnet of uniform cross section which was uniformly magnetized through its entire length, and if, further, we could break it into short pieces without demagnetizing it, the statement would be true; but as it is impossible to break a magnet into pieces without demagnetizing it (even theoretically), for the theory shows that a short magnet cannot retain the same intensity of magnetization as a long one, and as in practice the other conditions are seldom fulfilled, it is needless to add that Mr. Bain is right, and that the statement he quotes is untrue.

FIG. 1.

I mentioned uniform intensity of magnetization and cross section as conditions, which is equivalent to saying that the total strength of magnetization at each cross section is the same. If the cross section is variable, and the intensity of magnetization variable reciprocally to the cross section, the same condition is fulfilled. I will add that it would be impossible to so magnetize such a magnet in practice.

Surely there is no mystery in the statement that the strength of magnetization being the same at every section, including the ends of the magnets, when the magnet is divided at any given section without disturbing the magnetization, the new poles will be equal in strength to the old; and yet this is what the quoted statement means.

The true significance of the experiment, as tried by Mr. Bain, lies in this, that each fragment has two poles, and that the aggregate of all the fragmental poles is greater than the original poles, *i. e.*, greater than could be accounted for on the supposition that the original poles are divided among the fragments.

As it is impossible to measure exactly the strength of each pole of every fragment, their equality cannot be proved by direct experiment, but is an inference from the observed fact that each fragment has two poles; for if a fragment had two unequal poles it might be again divided so as to remove the excess of the greater, in which case we would have two fragments, one with two equal poles and one with only one pole.

As far as my experience goes, most of the great errors in magnetism are of a similar nature. For instance, in a magnet which is solenoidal the free magnetism is all on the surface, which presents a certain amount of analogy with a statically electrified conductor, in which, as we know, the electricity is all on the surface. With the conductor it makes no difference whether it is solid or only a thin shell. Now, I presume that some one was misled by this analogy, as I can see no other way in which the conclusion could be reached, that it made no difference whether the core of an electro-magnet was hollow or solid.

Mr. Weston once had a pair of electro-magnets made as near alike as possible, except that the core of one was solid, while the other was hollow with closed ends. As might have been expected the solid core gave much the better result, and yet Mr. Weston had been assured by an electrician of high standing that they would be both the same. It is possible that under certain conditions a hollow core might give a better result than a solid one, as, for instance, when the winding was insufficient, but in such a general form as the above statement it is untrue.

The law of attraction is one of the chief stumbling blocks, and was once the basis of a warm discussion between Sir William Snow Harris and the mathematicians.

The law is, that the attraction or repulsion between two poles is numerically equal to the product of the strength of the poles divided by the square of the distance between them.

Now, strictly speaking, a distance is only determinate when measured between two points, and inasmuch as a magnetic pole is never a mathematical point, and as induction further complicates the case in practice, the law thus stated is of no use in calculating magnetic attraction except to mathematicians. Poisson has shown that the potential of a magnet which is uniformly magnetized parallel to a given direction is equal to the differential coefficient of the potential of gravity with respect to the distance of the point at which the potential is measured, namely, the force of gravity. So although gravity and magnetic attraction follow the same law, the force in one case is equal to the line integral of the force in the other.

FIG. 2.

This theorem would lead to the solution of a large number of problems in magnetism by the auxiliary solution of the corresponding problem in gravity, but for the fact that the only case known in which a body is magnetized as stated is that of an ellipsoid.

This shows the difficulties experienced even by mathematicians, but as it is my object to encourage, and not to discourage, I will state that although we have the complete solution of very few magnetic problems, yet for the most part in practical cases we can form general ideas which will be of great assistance to us.

Another common error is to confound the attraction between the poles of a dynamo, or between the poles and the armature cores, with the intensity of the field there, and this with the electromotive force developed in the armature. Thus, a great many think that a slight increase in the inter-polar space causes great loss in the field because the attraction diminishes rapidly as the poles are separated. The fallacy of this was shown by Marcel Deprez in a paper lately published in THE ELECTRICAL WORLD.*

One of Faraday's well-known experiments is very instructive on this point. A bar magnet is rotated on its axis and a conductor led from the centre of one pole to the neutral line, at each of which points it has a sliding contact, as in Fig. 1. The same current is induced whether the wire leads around close to the magnet where the field is intense, or at any distance from it where the field is less intense (providing the resistance is the same), and also if the magnet is stationary and the conductor revolves.

In this case it is evident that the intensity of field is not the measure of induction, and even if it were, the attraction does not come in at all, as there is nothing to attract, and if we put a piece of iron near the active pole, as at *A*, Fig. 1, the field will be somewhat contracted and there will be considerable attraction; but the current will not be increased, as the induction of the iron on the magnet may be neglected. If in a given dynamo the magnetization is increased, the attraction, intensity of field at a given point and electromotive force are all increased in the same ratio; but this is a different case.

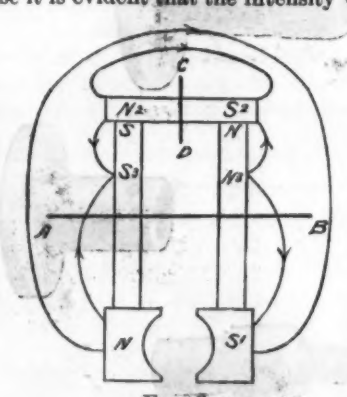


FIG. 3.

Mr. H. F. Watt † has partly anticipated my idea. In regard to the disposition of the wire in the field I agree with him that the magnet coils should be placed end on, and should be as close as possible to the armature; but, further, I question the great value of the yoke uniting the ends of the magnet cores, and claim that external field, especially when due to the portion of the magnet well removed from the armature, does not necessarily represent loss of induction.

First, as regards the position of the coils. It is well known that if a system of conductors is formed, as in Fig. 2, and a current of given strength circulates around each of the smaller circuits in the same direction, the magnetic effect is precisely the same as that of the same current circulating through the periphery of the whole, and not entering the smaller circuit at all. This shows the advantage of one large coil and core over several smaller ones of equal area of cross section; and, as where several small coils are used the total cross section is generally less, the disparity is still greater.

I think that this is generally understood now by dynamo builders, though at one time it was not. Supposing the first convolution of wire to be wound on the core where it will have the greatest efficiency, the second convolution, in order to have its field added without loss to that of the first, must occupy the same position, which is, of course, impossible, and all we can do is to wind it as close to the first as possible, in which case the resultant field is not quite equal to the sum of the two fields, but each partially neutralizes the other. The farther the winding is continued in this direction the greater this loss, so that in a very long magnet the remote portion of the winding is almost useless as regards the field in the vicinity of the armature. On the other hand, if the magnets are shortened and the wire wound very deep, the field may be too much widened for the armature, but it would have to be an extreme case to produce this result. The deeper the wire is wound the more it takes for each convolution, but again the more effect it has up to the above limit.

The magnets should be placed end on, for in all other positions part of the field is neutralized in obtaining a resultant in the desired direction, and this resultant is only obtained by the use of massive pole pieces, and I think that machines with such pole pieces and side magnets would be greatly improved by removing the magnets and winding the wire right around the pole pieces.

A test of this disposition of field wire was furnished by a model of the Thomson-Houston machine at the Philadelphia Electrical Exhibition. It consisted merely of wire with no iron whatever, the field being simply two coils, very short in the axial direction. It ran as a motor when a current was passed through it. How many ironless models of side magnet machines would run at all in that way?

Next, as regards the yoke, I think its effect is principally to lessen the external field without much benefit to the useful field. It has been said that the long magnets of the old Edison dynamo developed auxiliary poles above a certain point, because of their great length; I have observed these poles in dynamos with short magnets and consider them due to the partial action of the yoke.

Let Fig. 3 represent the field. If the yoke is taken off, the cores will be polarized as indicated by the letters $N S$ N^1 S^2, with the neutral line at $A B$. Now, if the yoke is restored it will be polarized by induction as indicated by the letters N^2 S^2, which will partly neutralize the field above $A B$, but never exactly, whatever its size or shape. If it could, the neutral line of the whole would be at $C D$, and a compass needle carried around the machine would only once turn end for end with regard to the machine. As it is, however, N^2 S^2 have more action on S N^1 than on S^2 N^2, points lower down, so that, though S is south with regard to N^1, it is north with regard to S^2, and N^1 is south with regard to N^2; so that a compass needle will reverse twice between N and S, and the same on the other side. The yoke itself may exhibit the same phenomenon.

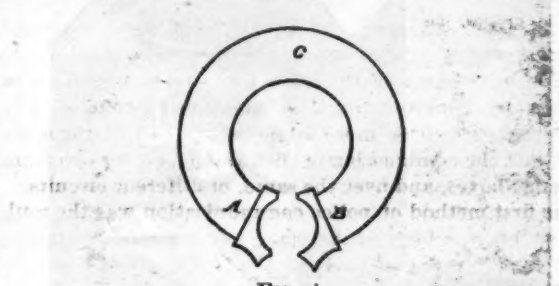


FIG. 4.

Now, in view of this theory, how much internal field is lost by taking off the yoke altogether? I think not as much as is generally supposed. There is a dynamo on the market in which the field magnet is in an annulur form, as in Fig. 4, which approximates a closed solenoid, and, of course, reduces the external field to a minimum; but, is this external field really utilized by transferring it to the internal field, or is it simply neutralized? I think principally the latter. The wire at *A* and *B* gives nearly its full effect to the useful field, while that at *C* has no other effect than to neutralize the external field of the other wire. The rest of the wire partakes, more or less, of both these conditions.

An Automatic Target Indicator.

A French inventor has brought out a target which automatically registers, or rather indicates, the point struck by the bullet, in a very ingenious manner. This is effected by dividing the surface of the target into numerous small squares, which are attached at the back to stiff springs. Behind each such square a metallic ball rests loosely on the bottom of an inclined plane. When a square is struck by a bullet the ball receives a smart blow and rolls up the incline; in so doing it closes a number of contacts, which number varies according to the position of the square upon the surface of the target. It will then be easily understood how an index, having a step-by-step movement, actuated by an electro-magnet, and placed at the firing point, is caused to indicate the result of the shot. A somewhat similar arragement, says the London *Electrician*, made by Messrs. Eidsforth and Mudford, of Holloway, was tried some years ago at Wimbledon, and gave very good results, but for some reason or other its use was not continued.

Car Lighting.—The New York Railroad Commissioners submit a bill providing that in car lighting no oil shall be used less than 300 degrees fire test. One of the commissioners, however, submits a bill absolutely prohibiting the use of kerosene or any other inflammable oil on passenger cars after July 1. This latter view of the case will, however, in time, force itself on everybody without legislation, it being impossible to gainsay the superiority of electric lighting for car purposes.

* Read before the Electrial Section of the American Institute.

† See THE ELECTRICAL WORLD, Jan. 8, 1887.

* See THE ELECTRICAL WORLD, Dec. 4, 1886.

† See THE ELECTRICAL WORLD, Jan. 22, 1887.

Improvements in Fire-Alarm and Police Telegraphs.

BY T. F. GAYNOR.

The fire-alarm telegraph is in practical operation in nearly all the large cities. Hundreds of the smaller cities, however, are as yet unsupplied, while the police service is in use in only about a dozen cities altogether. As communities having the fire-alarm system are constantly making changes and adding new apparatus, and the smaller cities are now becoming alive to the necessity of these inventions, the importance of the science and business is apparent.

Municipal telegraphy has hardly kept pace with the progress made in other branches of electrical application. The improvements in this line have been in details of mechanical construction, the non-interference of box signals when two or more boxes are pulled at the same time, and the combination of fire and police service from the same boxes, and over the same, or different circuits.

The first method of police communication was the multiple call-box, which is the same as the district telegraph messenger service of to-day. To this the telephone was added a few years ago, the devices for signaling being arranged in small sentry-boxes or booths, having a lamp on top, and provided with a glass roof, so that the mechanism within might be readily seen day or night by the person wishing to operate it. Only policemen and other authorized persons have keys to unlock the doors of such booths and operate the enclosed mechanism. A visual signal for police use has recently been patented, by which a colored glass globe can be electrically thrown up around the flame of a specially constructed street lamp by the chief officer on duty at headquarters when it is desired to communicate with an officer on his beat.

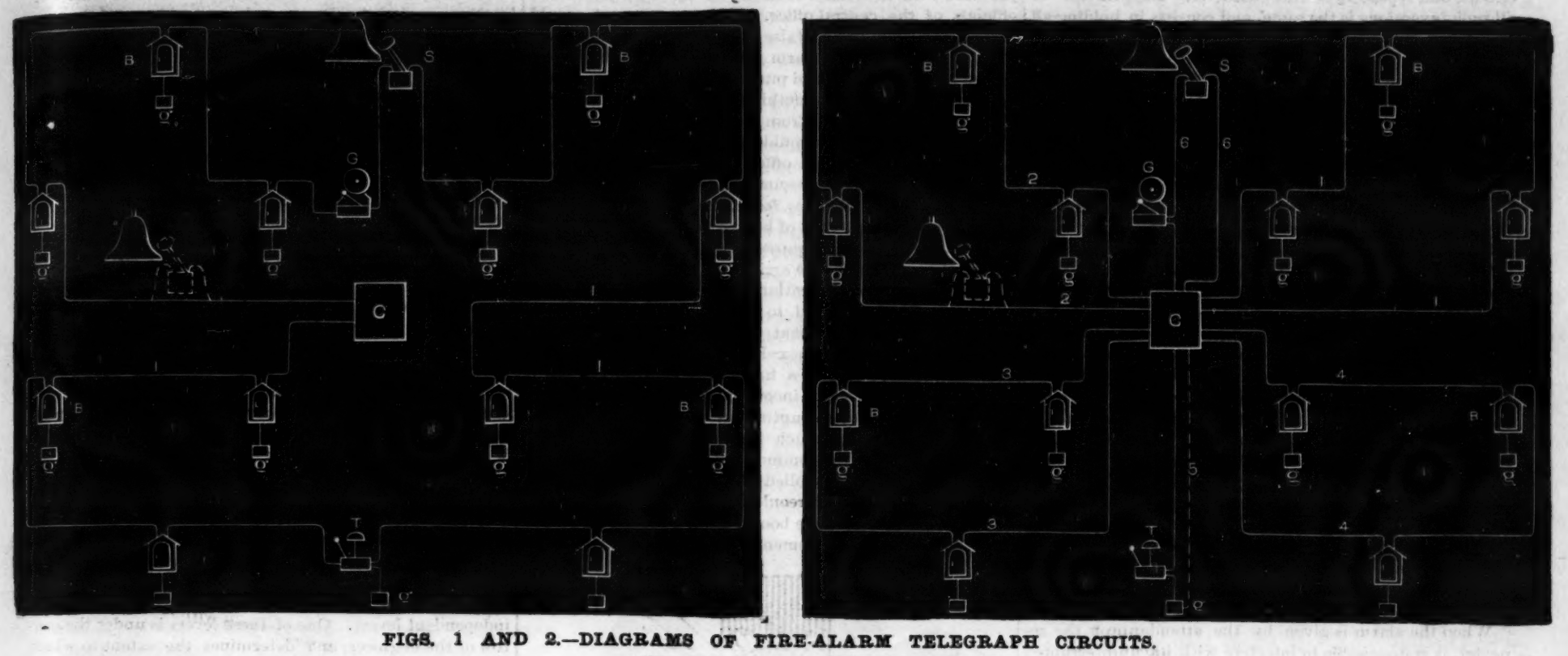
Most systems of this class are constructed upon single-wire closed metallic circuits. But when the gongs and bells are on circuits separate from the boxes, the former are sometimes in open metallic circuit. Some systems have recently been constructed upon two-wire loop circuits, like the incandescent electric light system, the boxes working in multiple arc open circuit. When the police service is combined with the fire-alarm, an additional wire is run from the boxes to the police office; or else a ground circuit is established with the same result, thus giving two independent circuits.

Still other circuit systems are coming into much favor of late on account of the minimum battery power required and because of the numerous advantageous combinations of circuits which can be made for various uses, and the facility with which defects can be discovered and remedied.

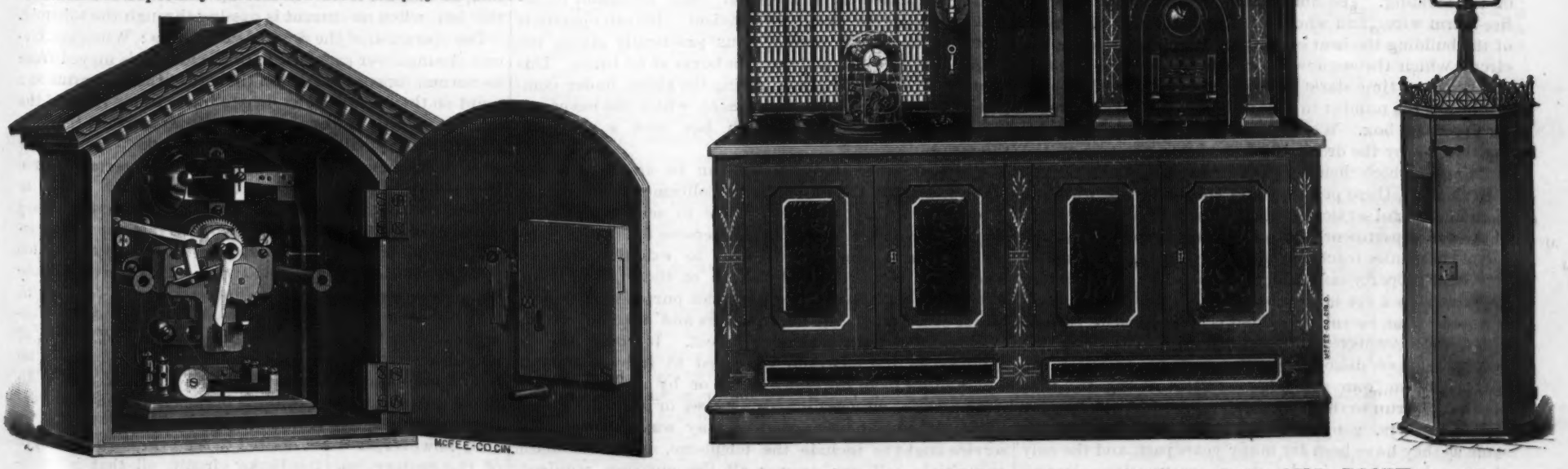
Fire alarm systems operate on either the automatic or the manual plan. In the automatic system all the gongs, bell strikers, etc., are automatically set in operation by the act of starting any of the signal boxes. The mechanism may be all on one circuit, as in the diagram Fig. 1, or in separate circuits, as in Fig. 2. When arranged as in Fig. 1, no central office mechanism is required except the battery, with a galvanometer and keys to test the circuit occasionally; but as a defect in the circuit would leave the entire city unprotected until it is remedied, the plan of dividing a city into separate circuits is preferred. This division of circuits, however, requires the use of a piece of mechanism known as an automatic repeater, by which the signal sent in on one circuit is repeated over all the other circuits and apparatus in the system. This plan requires additional wire and batteries, and other office mechanism for testing purposes, but it is much better than a one circuit system, because a disabled circuit leaves unprotected only that portion of a city covered by such circuit.

In the automatic plan, all the boxes, gongs and bell strikers are timed to suit the action of the slowest bell striker in the system. As this time will average from half a minute to a full minute for each round of the box number, and as four or five rounds are usually struck on the bells, it takes from three to five minutes to strike a single alarm complete after a box is once "pulled." The advantage of this automatic plan is that the central office machinery has been less expensive than that of the manual system, as heretofore manufactured. It also dispenses with the necessity of having an attendant constantly stationed on duty at the central office to receive alarms coming in from the signal boxes, and transmit them to the bells and other mechanism in the system, as this operation is performed by the automatic repeater instead. This arrangement, like all other automatic devices, is liable to accident and derangement, and requires the continual care and attention of some responsible man to keep it in working order.

One of the imperfections of the automatic system is that when any of the wires are broken, grounded, or crossed with other wires accidentally, such interference causes a confusion of signals and false alarms, and greatly impairs the efficiency of the system. Again, two or more boxes are frequently pulled about the same time for the same fire, by different individuals unknown to each other; and it also happens that more than one fire breaks out at the same time, and many instances are known to the writer where this has indeed occurred. If a second box is



FIGS. 1 AND 2.—DIAGRAMS OF FIRE-ALARM TELEGRAPH CIRCUITS.



FIGS. 3, 4, AND 5.—FIRE-ALARM TELEGRAPH APPARATUS—CENTRAL OFFICE OUTFIT, SIGNAL BOX AND BOOTH.

pulled during the four or five minutes after the first one is operated, the action of both boxes at the same time causes a confusion of strokes on the bells, and the exact location of the fire can only be guessed at, and thus valuable time is lost to the firemen.

To overcome this difficulty, what is known as the non-interference system has been invented, and a number of patents have been granted to various individuals on boxes, circuits and repeaters of this character. The principle of all such inventions is the same, and consists in holding all the other boxes inoperative, while the one first pulled is acting. This, however, is but the elimination of one difficulty by the substitution of another, namely, leaving the whole city unprotected during the four or five minutes. For, should a fire break out anywhere else in the city during this interval, it would be impossible to give an alarm for it until the first box had ceased to act.

In the manual system the circuits are arranged as in Fig. 2. The boxes, bell strikers and gongs are in separate circuits. When an alarm comes in from a box, it is received on a bell, register, or other device in the central office c, by an attendant there. When the attendant knows it to be a true alarm and not an accidental interference with the wires, he sets a repeater in operation, which gives the alarm on all the bells, gongs and other alarm mechanism in the system. Sometimes a special circuit known as a register, or joker circuit, connects with a register placed in each engine house, and this circuit is manually thrown into connection with the operating box circuit, thus giving the firemen automatic and rapid communication, direct from the box. By this arrangement the boxes can be, and are in fact run very rapidly, and complete their signals in a few seconds, so that unless two boxes are started simultaneously (which is practically impossible), there can be no interference. Hence, non-interfering boxes are unnecessary; all alarms can come in when the boxes are pulled, and no part of a city is left unprotected, as in the other system.

When the alarm is given by the attendant on the repeater, it is impossible to interfere with its uninterrupted sounding until the operator sets it again on another number. As the bell striking mechanism works slowly, as already stated, the firemen taking their warning from the "joker" are often in the street with their apparatus on their way to the fire before the gong has struck the first round of the box number. When accidents or lightning affect the wires, as already mentioned, such interferences are distinguished and understood by the attendant at the central office, and consequently no false alarms from such causes are ever sent over the system. As the whole system is constantly under the watchful care of the attendant, any accident to any part thereof can be promptly discovered and repaired. The joker circuit is also sometimes utilized as a telephone circuit for communication between the engine house and department headquarters.

It can thus be seen that the manual system is in many respects superior to the automatic, but hitherto its central office mechanism has been expensive and of a complicated character, and requiring the constant attention of expert electricians. This is the reason why only the very largest cities could have this kind of service.

In some of the most extensive business houses in the large cities, thermostats are arranged in each room and connected with an iron-cased annunciator on the outside of the building. The annunciator is connected with the fire-alarm wires, and when a fire breaks out in any room of the building the heat causes the thermostat to close the circuit which throws down a drop in the annunciator and at the same time starts a box mechanism which communicates the number to the fire department like the regular fire-alarm box. When the firemen arrive at the building they see by the drop, which is visible, the part of the building in which their services are needed.

In Chicago, these private boxes are connected with the insurance patrol service and the alarm is given from there to the fire department. It sometimes happens that the patrol companies reach the building with their tarpaulins and other property-saving apparatus before the inmates know there is a fire in their building.

Another plan recently invented is to have push buttons in buildings connected with the nearest box, so that the occupants, upon discovering a fire on their premises, can ring the alarm from the house without losing the time necessary to run to the box.

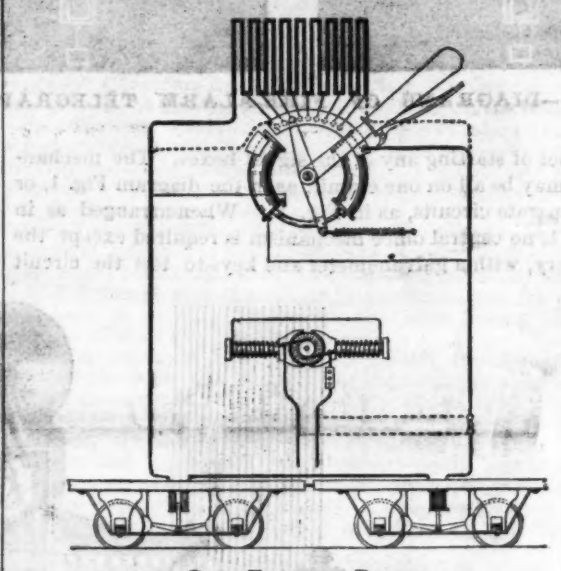
Bell strikers, gongs and registers are essentially the same as they have been for many years past, and the only changes have been in details of construction. During the last four or five years several indicators have been invented which show the number of the box pulled in plain figures like an annunciator.

When a person discovers a fire, he procures a key from a policeman or some keyholder living near a box; he then unlocks the door, opens it and proceeds to "pull down the hook and then let go." As it takes several minutes' time to go through these several operations, and the door may be frozen or stuck fast, or, as he may get confused, it would evidently be an advantage if he could at once give the alarm by the simple act of turning the key in the keyhole—an operation with which every one is familiar. It would even be much better if he could go at once direct to the box and give the alarm by pressing a push button without having to procure a key at all, thus saving several valuable minutes usually lost in searching for a key. The necessity for this kind of a signal has been recognized by the invention of what is known as the "keyless box," now in use on the business streets of some of the large cities. But as mischievous persons can give false alarms from such boxes, they are not adapted for general use.

A signal box ought to be placed within a booth into which a person would be obliged to enter and close the door before he could give an alarm. The door could be provided with an electric lock under the control of the officials of the central office. This arrangement would deter people from giving false alarms through fear of detection, and when such alarm would be given the guilty person could be caught and punished. The person giving a true alarm would have nothing to fear, and would, at the utmost, be detained only from a few seconds to two or three minutes, when he would be released either automatically from the central office or by the first policeman or fireman, who in response to the alarm, reached the box and held a suitable key for that purpose.

By the present method of key boxes the person giving an alarm is absolutely required to remain at the box after giving the alarm until the arrival of the firemen, in order to tell them the exact location of the fire, and have his key released and returned to him. It has been demonstrated by actual trial that the average engine or hose company can reach a box half a mile away from the engine house in two and a half minutes after the alarm has been turned in. The inconvenience of detention is of slight consideration, amounting at most to only a few moments, and being much less than is usually lost in procuring a key to the common key box.

This lock can be controlled by an automatic device at the central office, which would regulate the time a person would be detained in the booth, from a second up to the time required for the firemen or a policeman to reach the



RIES ELECTRIC BRAKE.

booth and liberate him. As the lock would be operated from the central office in response to an alarm, it would be impossible to detain a person or prevent him from going to another box if the first alarm did not go in, as the object of the locking device is the prevention of false alarms, and as it is controlled by the central office attendant its occasional operation would be sufficient. He can operate it or not as he thinks proper, thus practically giving the citizen free access to and from the boxes at all times. This plan would bring the person giving the alarm under complete control of the fire department, which has never yet been accomplished, and which has been a great desideratum.

A bell or other alarm device can be attached to the booth to attract the attention of policemen or citizens to it when an attempt has been made to send in an alarm. The keys provided for authorized persons to liberate those giving alarms can also be used to examine the box mechanism without the detention of those using them. The booth can also be used for police purposes, so that an officer could report to headquarters and take his orders therefrom without leaving his beat. It could also be arranged so that he could be called to it by a suitable signal either from the police office or by a person in the neighborhood who desired his services or wished to communicate with headquarters in any way. This police service ought to include the telephone, as no automatic or multiple call can answer all the purposes required. This would give a perfect combination fire and police signal station, and, having a lamp on top, it could be readily found at night and the mechanism within easily seen and operated.

A perfected system, such as has just been described, has recently been designed by the writer for the Lexington Manufacturing Company, of Lexington, Ky. The illustration (Fig. 3) represents the complete central office outfit, having an efficient manual repeater, which sets the whole alarm mechanism, including the gongs, bells, etc., in operation. The mechanism can also be connected with the box circuits by a circuit closer, so that the system can be worked automatically. The outfit includes an annunciator, which designates the operating circuit and also a switch-board and complete testing set.

The signal box is shown in Fig. 4, the inner case being removed to show the mechanism. The mere act of inserting the key and turning it in the lock trips the mechanism and sends in the alarm.

The system of combined fire and police alarm described above has been embodied in a system of booths such as shown in Fig. 5. A person sending in an alarm may, if the central office choses, be held a prisoner in the booth if the alarm is thought to be a false one. He can, however, be instantly released if desired from the central office, or by the arrival of the firemen, who carry keys for the purpose. In this way the sending in of false alarms is completely guarded against.

Ries' System of Electric Brakes.

Attempts have been made from time to time to utilize electricity for operating railway friction brakes, as its acknowledged superiority, from a practical and economical point of view, peculiarly adapts it for this class of work. These attempts have, however, in many cases been unsuccessful, mainly because of the sudden strain and concussion upon the moving portions of the brake mechanism and wheels and the great abruptness and severity with which the brakes were applied when the circuit leading to the brake device was closed. In other words, that most important quality of the current so valuable in this and in other applications of electricity—its great speed and rapidity of action—proved most detrimental in the present instance, simply because it prevented that easy and gradual control of the current essential to success. Great difficulty was also experienced in properly regulating the amount of braking force exerted by the devices heretofore employed, and for varying this amount to suit the different requirements met with in practical work.

These difficulties have now, it is claimed, been overcome by Mr. Elias E. Ries, of Baltimore, in a very simple and effective manner by the employment in the brake circuit of an automatic circuit-closing device provided with two independent levers. One of these levers is under the control of the engineer, and determines the extent to which the brakes shall be applied, while the other is automatic in its action, and when the first-mentioned lever is moved operates to transmit and gradually increase the flow of current to the electro-magnetic brake devices, until they have reached the strength determined by the position of the first-named lever. By this means the brake devices are not only protected from sudden strain, but when the speed of the transmitting lever is once properly adjusted the brakes can be applied and the train brought to a standstill within the shortest possible space of time.

The accompanying illustration shows the arrangement diagrammatically. A series of storage batteries, shown in heavy black lines, are connected to the brake magnets near the wheels. The batteries are connected to a switch, so that a contact passing over them puts a successively increasing number of cells on the circuit. The cylindrical quadrant shown at the left is a solenoid which is connected in shunt with the battery circuit. Its core is prolonged and extends into a dash-pot or regulating cylinder, whose function is to regulate the motion and prevent the too rapid entrance of the core into the solenoid when the latter is energized. A spiral spring serves to return the contact-lever together with the core and piston-rod, which are firmly secured to the contact-lever, to their normal position, so that the lever will rest upon the first contact to the left when no current is passing through the solenoid.

The operation of the device is as follows: When the circuit closing lever provided with the handle is moved from its normal (open) position on the left of the apparatus to a point on the curved plate—say to the extreme right of the apparatus—only the current from the first cell of the secondary battery will flow through the brake circuit. The solenoid, however, being now energized to a certain degree by the derived current passing through it, now begins to attract the core and moves the contact lever to the second contact point, thus throwing two cells into the brake circuit and proportionately increasing its own force. This process continues, each additional cell thrown into the brake or working circuit also increasing the force with which the core is drawn into the solenoid; but as the dash-pot is adjusted to limit and regulate the rate of motion of its piston rod the movement of the contact lever across the face of the contact points is rendered uniform, and additional cells are thrown into the brake circuit until the entire battery is included therein.

If, however, it is not desired to send the entire strength of the battery into the brake circuit, all that is necessary is to move the switch lever along the curved contact plate, but not so far to the right as before, it being retained in position by the segment pawl. The operation will then be the same as before, except that when the contact lever has moved forward sufficiently it will come in contact with a projection on the regulating lever, and its further motion thereby arrested.

In case the cars are operated by electric motors deriving current from a central station, the storage batteries are replaced by resistances, so that the brake coils are gradually connected to the main source of current. This arrangement is also shown in the illustration.

From what has been said it will be seen that the circuit closing apparatus is not only adapted to regulate and control the admission of current to the electro-magnetic brake devices just described, but is equally applicable to other

forms of service, such for instance, as incandescent lighting, in which it seems well adapted to prevent the premature wear or decay of the incandescent filaments now occasioned by the changes in temperature due to the sudden manner in which the current is usually turned on or off.

The Elgin Mechanical Telephone.

At the late convention of the National Electric Light Association, at Philadelphia, considerable interest was taken by the members in the exhibit of the Elgin tele-

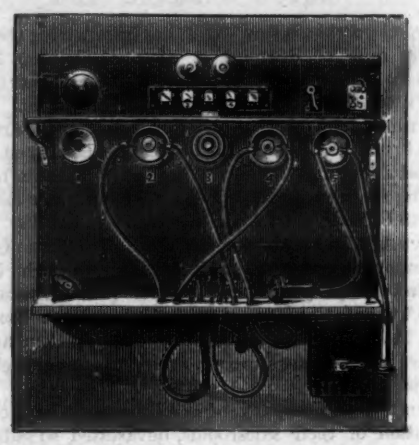


FIG. 2.—ACOUSTIC TELEPHONE SWITCHBOARD.

phone. From the room in which the instrument was situated, which was in the interior of the house, the line ran across the street making nearly a right angle close to the telephone; thence it made an angle of 45 degrees, and still another before ending in the offices of the American District Telegraph Company at No. 113 S. Broad street. Still another line with an equally circuitous and angular route ended at No. 1419 Sansom street in an opposite direction from the first line.

The regular telephone employed is shown in Fig. 1. It

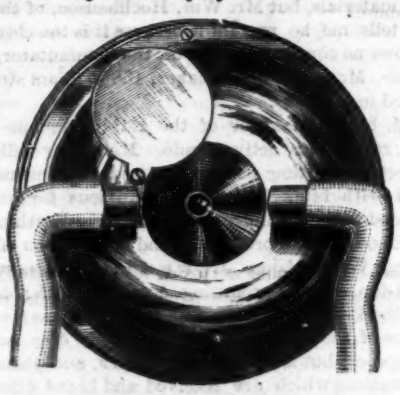


FIG. 3.—TELEPHONE WITH EAR TUBES.

is provided with a binding-post for the lightning arrester or magneto-bell connection.

The switch-board for effecting connection between different lines is shown in Fig. 2. The horizontal steel bar frame is employed for establishing the tension between two lines terminating in the diaphragms directly below. When the bar is strained, the two diaphragms connected with it are simultaneously strained so that they vibrate in unison. At the same time the lines are in electrical

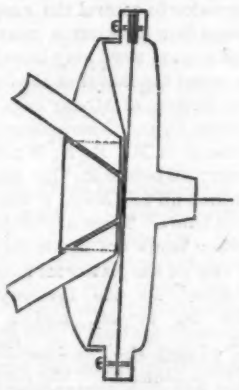


FIG. 4.—SECTION OF TELEPHONE.

connection so that the magneto operates the bells at the end of both lines. The board is provided with annunciator drops, which are operated in the usual way by magnetos at the various stations.

For noisy situations the telephone is provided with ear tubes, as shown in Fig. 3, and in section in Fig. 4. A private line exchange, on the system described above, has, it is said, been in operation in the works of the Elgin Telephone Company, at Elgin, Ill., for some time, and gives good satisfaction.

New Method of Making Battery Plates.

The oxide of lead electrode is coming into such prominence not only as an electrode for secondary, but also for primary batteries, that a new method devised for its production claims attention.

This method, invented by Messrs. W. H. Tasker and T. J. Jones, of London, Eng., and recently patented in this country, has for its object to produce porous and yet hard coherent masses of any desired form, mainly composed of oxide of lead, and capable of serving as efficient elements in a battery when reduced to porous metallic lead or converted into peroxide of this metal.

The process consists essentially in mixing together and molding while in a dry state the materials of which the plates are composed, and then steaming the mass while in the mold, whereby the soluble constituents of the mixture are dissolved and rendered active, so as to cause the mass to "set" or bind together in the mold, and at the same time leave interstices, which increase the porosity of the mass.

The inventors take an oxide of lead, preferably the monoxide (litharge), which is used alone when the plate is to be used as a positive element only, and which in other cases is intimately mixed with about 5 per cent. to 6 per cent. of inert porous material, such as ground white porous earthenware free from iron, or ground pumice-stone, or kieselguhr; there is then thoroughly incorporated therewith, while in a dry pulverulent state, a certain proportion of one of the salts mentioned below, while the same is in a crystalline form. This dry pulverulent mixture is then placed in a mold, consolidated by pressure, and while in the mold steamed by being exposed to a jet of steam or inclosed in a steam-chamber. The steam, becoming condensed, dissolves the salt throughout the mass, and so causes it to combine with the oxide of lead, which is caused to set in the mold in the form of a dense and coherent plate having the desired degree of porosity. This is usually done by directing a jet of steam upon one face of the mass contained in the mold until action appears to have ceased, and in order to

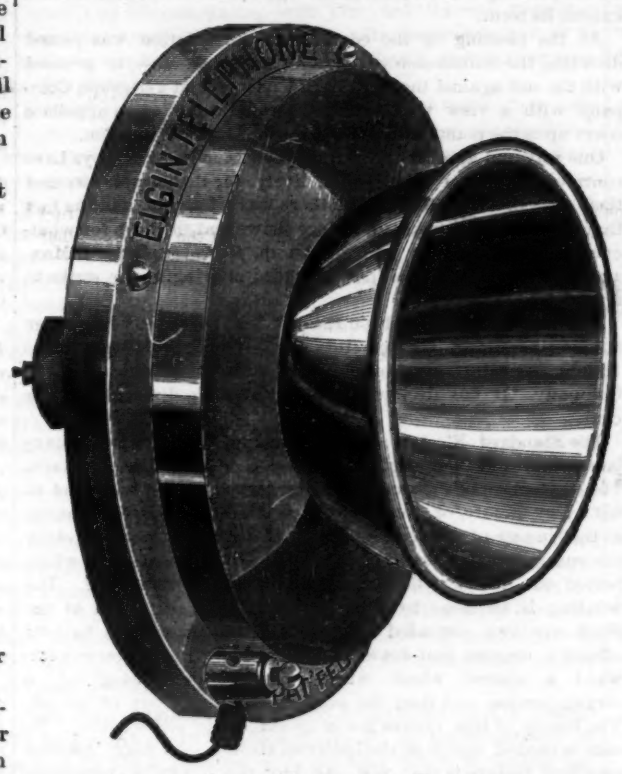


FIG. 1.—ELGIN MECHANICAL TELEPHONE.

insure the complete "setting" of the lead oxide, the mass is afterward thoroughly impregnated with a half-saturated solution of the salt of ammonia. The mass is then allowed to drain for a few minutes, removed from the mold, and dried in the air or by heat. The mass when dry is ready to be at once converted by electrolysis either into spongy metallic lead or into peroxide of lead (directly or indirectly), according as it is to be used as the positive or the negative element in a cell. In order, however, to facilitate this electrolytic conversion of the mass into peroxide of lead, it is preferable to immerse the same in a hot clear solution of chloride of lime, whereby the mass is superficially peroxidized, or, better still, to use a mixture of about twenty-five per cent. of peroxide of lead in the form of fragments or dust with the litharge, in lieu of the inert porous material before referred to, in which case the superficial peroxidation is unnecessary.

The salt found to be best adapted to the process is ammonic sulphate, in the proportion of about 5 per cent. of the weight of lead oxide used. Other salts may, however, be used. In order to harden the plates it has also been found advisable to mingle a little glycerine with the steam, by causing the steam jet to act as a spray producer upon a mixture of three parts of glycerine to one of water.

Driving Dynamos.

One of the favorite methods of driving dynamos at present consists in the use of friction clutches, by means of which a machine can easily be put in action or stopped without interfering with others on the same line of shafting. A friction clutch designed for this purpose, and known as the "Eureka," has recently been brought out by Mr. John A. Haffner, of New Brighton, Pa., and is illustrated in the accompanying engraving, Fig. 1. The hub and disc *B* is keyed fast to the driving shaft *A*; the discs *C* and *D* are fitted to clamp to disc *B*, and are held firmly by the powerful pressure of a number of spiral springs *E*, drawn together by bolts, and producing a great friction between the discs. When it is desired to engage or disengage the clutch, the hand-wheel *G* is turned in a corresponding direction, which, by means of a "right and left" screw, forces the V-shaped coulter wheels *F* between discs *C* and *D*, thus separating them and permitting centre disc *B* to rotate freely; this releases the power and stops the discs *C* and *D*.

When the clutch is not being operated, the hand-wheel *G* is supported by a rest *K*, so that both V-shaped wheels *F F'* are entirely clear of the discs. The rim of the clutch is provided with safety flanges, extending beyond the end of the springs, which prevent all risk to any one standing near or operating it. The clutch can be regulated for any desired work or power by the number and strength of the

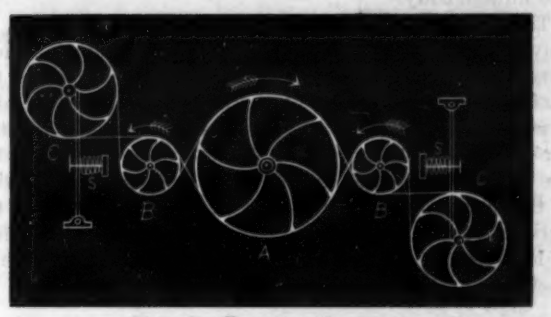


FIG. 2. DYNAMO DRIVING.

springs which clamp the discs together. When used on line shafts for driving dynamos, the disc *C* has a long hub to which the driving pulley is keyed fast. The hub is provided with oil cups, so as to lubricate the bearings of discs *C* and *D*, when standing still while disc *B* is rotating. Of late, improvements have been made so that the clutch can be operated from a distance.

Mr. Haffner has also designed a method of dynamo driving by which, it is claimed, all slip of the belt is avoided. The train shown in Fig. 2 consists of a centre driving pulley *A*, two dynamo pulleys *BB*, and two guide pulleys *CC*, connected by an endless leather belt, which runs on alternate sides of the pulleys from one end to the other, its direction being changed by the two guide pulleys *CC*. The latter are mounted on hinged frames, and their axes are inclined (not shown) so as to lay the belt on the

FIG. 3.

proper planes of the dynamo pulleys *BB*. The belt is also kept at proper tension by springs *SS*.

In this way very small driven pulleys can be used next to a large driving pulley; thus a high rate of speed is attained in a small compass. The pressure of the belts is around the entire surface of the pulleys, which gives a tight grip, thus avoiding slipping and side pull on bearings, and there is, therefore, no tendency to strain dynamo shafts out of line or heat them. The friction is thus reduced considerably, with a consequent saving in power.

The train is connected to the crank shaft by means of

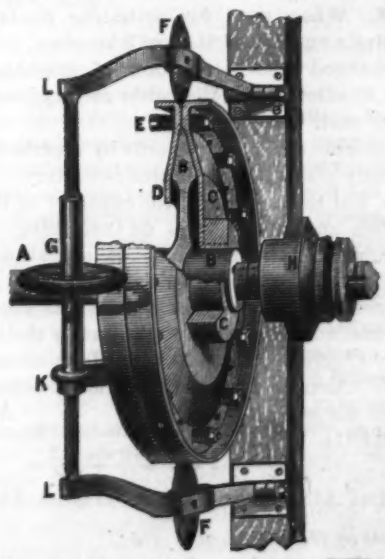


FIG. 1.—HAFFNER'S FRICTION CLUTCH.

a coil spring shown in Fig. 3, which equalizes the irregularities in the engine and transmits a steady and uniform power to the shaft.

Probing by Electricity.

At a late meeting of the New York Academy of Medicine, Dr. J. H. Girdner read a paper on the methods of detecting and locating metallic masses in the human body by the induction balance and the telephonic probe. He referred to the apparatus which had been constructed by Professor Bell for the purpose of locating the bullet in the case of President Garfield, and said that it had failed because at the time the patient was lying on a metallic mattress, which interfered with the working of the instrument. Now we have an apparatus which will detect and

locate any piece of metal wherever situated in the human body. In the construction of the induction balance a bichromate battery is used, with six cells, and an ordinary interrupter, the interruptions being about six hundred to a minute. The exploring coils were put in a framework of wood, which Professor Bell called the "explorer," while to the others the name "adjusting coils" was given. Thus in the primary current were two coils, in the secondary current were also two coils, and in the circuit was a telephonic receiver. When the exploring coil was not in relation to a metallic substance, there was silence in the telephonic receiver; but, as the explorer approached or receded from the metallic mass, the balance was disturbed, producing a musical tone in the receiver. The sound is distinct six inches from the metal, if located in the human body.

The new telephonic probe consists of a telephonic receiver and two wires, one terminating in a long, slender steel probe, and the other with a steel plate laid over the surface of the body in the neighborhood of the metallic mass, as determined by the induction balance. The steel probe being now plunged into the body, as soon as it reaches the metal a distinct click is heard. The practical working of the instrument was shown by locating a bullet in the chest of a soldier wounded during the civil war. A piece of lead was also recognized in the centre of a piece of beef.

The Partz Acid Gravity Battery.

To the Editor of The Electrical World:

SIR: According to the report in your issue of the 19th inst. of a discussion on motor batteries, at a meeting of the American Institute of Electrical Engineers, Mr. Mailloux gave a brief description of my acid gravity battery, from which he had obtained a current of four ampères with a solution of coquimbite, and expressed the opinion that it might yield a stronger current when charged with my solution, whereupon Mr. Curtis saw fit to remark: "Dr. Partz tried it in my office and it would not maintain more than three ampères."

I should not trouble you with a communication if it were merely to refute that assertion by declaring that I never was in the office of Mr. Curtis. I write because the subject-matter appears to require some elucidation. In discussions on the merits of voltaic batteries, the fact that each kind is reasonably suited only for certain purposes is too often lost sight of, and more or less confusion prevails in consequence. There is a limit to which the resistance of a voltaic cell based on the gravity principle can be lessened by a reduction of the space between the electrodes without the character of the apparatus becoming perverted, and since the strength of current depends on the internal resistance, there must be a certain limit to the number of ampères attainable. A battery of this kind should, therefore, not be compared with one specially designed for work demanding a greater strength of current—it being, of course, understood that the cells are connected in series. With a solution of chloride of sodium (1 to 5) as electrolyte and my "sulpho-chromic salt," (which is *not* made after a faulty French formula) as depolarizer, an acid gravity cell without porous cup furnishes 5.5 ampères; with a solution of chloride of ammonium (1 to 5) 6 ampères, and by adding to either solution 10 per cent. of hydrochloric acid an additional ampère may be obtained. When used for actuating dental mallets, which require a current of at most 3 ampères, the cells are generally charged with a solution of sulphate of magnesia (1 to 4), after which the tubes are supplied with sulphochromic salt.

There are some strong statements by members of the C. & C. Company respecting their plunge battery. They may be all right, but the one that "the capacity of the battery is 12 ampères and it will keep on furnishing 12 ampères without declining until the chemicals are all used up," I should like to see proven. As a battery for running sewing machines, etc., for which a patent has recently been granted to me, will soon be brought out by the Partz Electric Battery Company, I may have ere long an opportunity to invite Mr. Curtis to a competitive trial of apparatus both designed for the same kind of work. A. PARTZ.

PHILADELPHIA, Feb. 26.

The Effect of Atmospheric Electricity on Telephones.

To the Editor of The Electrical World:

SIR: I presume you have noticed the peculiar sounds occasioned by foreign currents on telephone lines, but have you ever noticed at times the low roaring sound of the battery alone? Recently while listening to a like sound on a telephone line I cut the instrument out to see if the sound could then be heard, and I found that it could. I then disconnected the instrument from the line wires, but could still hear the same sound, not unlike the roar of a distant river when the water is high in spring. Next I disconnected the battery, whereupon the roaring instantly ceased. Then I looped the receiver only into the line, and again I heard the sound as before.

Thus I found it to be something which is not always confined to the line, yet working, seemingly, in unison with it. Please remember that it was not the humming sound usually heard when the battery is new and very powerful, but *exactly* like that upon the line. Now, could it have been caused by some peculiar change taking place in the electrical condition of the surrounding atmosphere? There was a change taking place at the time, the thermometer registering 36° above 0. This was in a few hours followed by rain. Or, was it something peculiar to the battery alone? If so, what was the cause of it?

B. E. H.

MOUNT HOLLY, Vt.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Feb. 28, 1887.

There have been three bills introduced at Albany relating to the subject of the electric subways in this city. One of these extends the term of office of the present commission to Nov. 1, 1889, confirms what it has done, and gives it authority to go on and complete the work. Another creates a new commission, consisting of the Mayor, Controller and Commissioner of Public Works, to devise new plans and begin all over again, and the third also constitutes the Mayor, Controller and Commissioner of Public Works a commission to control the business, with power to add two engineers to their number. The idea of Mayor Hewitt and his right-hand man, Mr. Beekman, is to put the subways in charge of the Public Works Department. It will be interesting to see whether and how the change is made.

The Subway Construction Company was ordered to suspend all operations by the Commissioners of Electrical Subways, on Saturday last, Commissioner Gibbens explaining that the legal status of the Board, under Judge Van Hoesen's recent decision, made this action unavoidable. Applications from the Metropolitan Telephone Company and the Baltimore & Ohio Telegraph Company for permission to erect new poles and string aerial wries, pending the completion of the conduits, were laid over until March 15, when it is expected that the Legislature will have acted on the pending bills to confirm the legality of the commission and extend its term.

At the meeting of the commission, a resolution was passed directing the commission's attorney, Charles A. Hess, to proceed with the suit against the New York Underground Telegraph Company with a view to obtaining the adjudication of an appellate court upon the points raised in Judge Van Hoesen's opinion.

One way and another the Mutual District messenger boys have contrived to make things quite lively for their employers and their customers. All last week there was a ferment, and the fact that at least three strikes took place shows that the boys for whatever reason were pretty well worked up. However, General Manager Rider, of the Mutual, has succeeded in bringing the strike to an end for the present.

It is stated that the Edison Electric Light Company has under advice increasing the capital stock from 12,942 shares to 16,000, par $100; also consolidation with the Western Edison Company. It has declared a convertible scrip dividend of 7 per cent.

The Standard Electric Clock Company, 252 Broadway, have lately improved their electric time system in a number of details. The mechanism of their clock is so arranged that it will wind itself every minute, or, to be more precise, 60 times in 54 minutes, so that in case of an accidental loss of battery power, the clock has energy enough stored to run it for 6 hours, during which period the defect will declare itself and be remedied. The winding is all done by leverage. On the main wheel of the clock are two extended pivots that cut in on the battery circuit a magnet that draws a lever. This, in turn, carries forward a geared wheel which tightens a spring at a certain tension, and then the magnet cuts itself out of circuit. The beauty of this system lies in its automatic self-winding. No care is needed, except at the batteries about once a year. Another excellent feature is that you can buy the clocks or regulators and put them in yourself, or they can be put up for you at small cost, giving you the ownership of the clock at a reasonable price. It is said that you cannot with this time system close the circuit by any accident so as to short circuit and destroy the battery.

Mr. Theodore Mace, manager of the Vitrite and Luminoid Company, of 14 Dey street, has returned from Europe after an extended tour of nearly a year's duration, devoted to an investigation of European novelties and methods. He has imported a number of specialties for the electric light business, such as electroliers, reflectors, radiators, cut-outs, switches, etc. He foresaw the desirability of home production of the Vitrite lamp, and therefore had all the machinery and plant sent to this country. It is now in full blast at Newark, N. J., with a large demand for its output. The Cardew voltmeter, also introduced by him, is receiving considerable attention. It is well known the company has a large line of test instruments, all of which may be seen and examined at the salesrooms, as above.

J. H. Bunnell & Co., Nos. 106 and 108 Liberty street, are now selling an electric gas-lighter called the "Volta torch," which requires no battery, working by means of induction. This adds another item to a stock already bewildering in its variety, and so complete as to include everything that is needed for the most diverse applications of electricity.

Mr. H. P. Hungerford, manager of the Electrical Supply Company, is highly pleased with the success of the improved Excelsior disque battery just out. It is in demand among the telephone people, and is specially favored by contractors for hotel work, flats, houses, steamers, etc., on annunciators, burglar alarms, bells, and all work where a really first-class open circuit battery is needed.

The formation of a new electrical enterprise connected with the American Electric Manufacturing Company is announced, which is, in fact, the extension of that company to foreign countries. I have already given some of the details. It is known as the American International Electric Light Company (limited), and its board of directors comprises the following: L. M. Bates, formerly of Bates, Reed & Cooley, New York; Rowland N. Hazard, president of the American Loan and Trust Company, New York; Henry F. Gillig, general manager of the American Exchange in London and Paris; E. H. Goff, president, and Col. William A. Stedman, treasurer of the American Company, New York. Mr. W. W. Monroe, formerly with the Edison Company, and more recently with the Thomson-Houston Company, will be secretary, and will push the business in foreign countries. Mr. Bates will probably be president of the new company. The business of the American company is said to have greatly increased in the past four months, and the company has leased the entire second floor in the new building of the Metropolitan Telephone Company on Cortlandt street, which will be ready for occupation about the 1st of May next. The American Company has secured the control of the Saratoga Gas Company, which will be combined in an organization with the local electric lighting plant of the company, the united interests being merged into a new company, which will be under the management of Col. Stedman. The American Company's New Haven factory is now in process of preparation for work, and will be occupied in May. It will enable the employment by the company of a force of from 800 to 1,000 men.

Mr. George H. Pride, 9 Dey street, has been wiring the big insulated wire mills of Roebling & Sons, at Trenton, N. J., for some 250 lights. Lamps are placed over each machine for braiding, etc. Vitrite and Luminoid lamps are employed. The efficiency of this machine is a very high one. The department at the mills is in charge, I understand, of Mr. F. H. Angell.

I hear that a prominent company is going to wire the big Equitable Building for telegraph, telephone, time and other electric service. It will be remembered, as I noted the other day, that all the electric light work was done by the United States Company, under the immediate supervision of Mr. E. T. Lynch, Jr. The United States Company will have its offices in the Equitable.

Mr. W. C. Quinby has lately organized a large company at Baltimore, Md., called the Coquimbite Battery Company. The company are now making some six styles of open and closed circuit batteries.

The Phœnix Glass Company, of 729 Broadway, have completed the renovation of their salesrooms, devastated so sadly by fire lately. The present place has the old cheerful look, while many details of beauty have been added. The exhibition of opal-flint electric light glassware in plain and fancy colors is "a sight to see." They have added a new line of solid radiators for incandescents, also the same in cut glass and in pressed imitation. The names of the goods might, in fact, be read off from a florist's catalogue—tulip, daisy, dewdrop—and all these are in opalescent, ruby, amber, etc. There are also "snowballs" in all colors, and a full line of arc light shades. Mr. A. H. Patterson is the cicerone, and has much that is interesting to say about the goods.

Mica is often used in insulating the commutator sections of dynamo armatures. It is said to be expensive in comparison with other materials, but Mr. Wm. Hochhausen, of the Excelsior Company, tells me he prefers it because it is the cheapest in the end; it allows no copper to collect on the commutator, and it is very durable. Mr. A. O. Schoomaker, 158 William street, carries this material in all sizes.

Mr. H. M. Lavor, manager of the Edison Machine Works, 19 Dey street, reports an active trade. Mr. Lavor sells to all the various electric lighting companies, and it is but natural they should deal with him. They are all anxious for well-balanced shafting, good pulleys, hangers, etc., and for everything that goes to effect economy in the production and distribution of power.

Mr. George Westinghouse, Jr., is a man of restless energy, ever on the alert for new and promising enterprises. I note that according to the Pittsburgh papers an exhibition was given recently in his office of the Lowth telephone, which does not transmit articulate speech, but is applied to the neck, and thence receives speech vibrations which are received and heard after the usual manner at the other end of the circuit. Some of these instruments have been made lately in New York, I understand, and they are said to give excellent results.

E. A. Wildt & Co., 83 Murray street, are meeting with a brisk demand for their improved electric bell. It is an iron box bell admirably made and finished, and is dust and insect proof. All the working parts are covered, and the hammer as it projects upward from the box carries a little shield attached to the armature. Thus, whether the hammer is in motion or at rest, the orifice through which the hammer passes is perfectly covered, so that no hurtful substance of any kind can penetrate into the box. The armature has a very neat side adjuster, and at the bottom of the box is a little regulator to control the amount of battery put into service. The same firm have out a neat, cheap and simple door opener, of which a good word may be said.

You have already noted the fact that the Julien storage batteries are in use on the Boston & Albany cars. I found time the other day to go up to the Grand Central depot and see the car for myself. It was in charge of Mr. R. N. Woodworth, whose energy must certainly carry all before it. He has put in 60 cells of Julien battery, weighing all told about a ton. Each cell gives 2 volts and 150 ampère hours. There are 23 Edison lamps of 16 c. p., 110 volts. Eighteen lamps are inside the car that I saw, one in the lavatory and two on the platforms to be switched on as the train enters a station. In the lavatory are switches to turn all the lights on or off, and a special switch to throw in 51, 52, 54, 56, 58 or the whole 60 cells. Only 56 of the compact little Julien cells were in use when I was there, but the lighting was simply magnificent. The unusual brilliancy of the car attracted people from all over the depot, and when the men came in from the U. S. mail car to see what was going on, they all said with an emphasis there was no mistaking: "That's the light for us." These men now have to do their heavy and responsible work under the fierce heat of 15 oil lamps, which are mere candles against the Edison lights run off the Julien batteries. I think the mail sorters are right. As to the question of cost, Mr. Woodworth figured out a total of $780 for the batteries. These cells are guaranteed for 2 years and the Julien Company will "keep them up" for 3 years more at a charge of $200, making $980 for five years. The Weston station at Columbus avenue, Boston, has undertaken to charge at 75 cents per car per day. The cost of the lamps can be put at $1.50 apiece. Say they run on the average 1,200 hours, and placing the average run of a night car at 8 hours, there is a car life per lamp of 150 days, or 2 per annum. Out of all these elements, and remembering that the running of these lamps involves no extra work on any one, Mr. Woodworth figures—and fairly I think—a total cost per car of about $2 per day. I do not know of any other system of illumination for cars that can come into competition with electricity on any such basis as that. The car I saw is now running on the Boston and Suburban. The connection for charging is easily made, the plugs being so constructed

that no mistake is possible in inserting them; and the charging with a current of from 15 to 20 amperes takes but a few hours. I understand that Mr. W. H. Barnes, the manager of the Boston & Albany road, is greatly pleased with the success obtained, and has given his order for the equipment of twelve cars running between New York and Boston. Mr. Walter Webb, of the New York Central Sleeping Car Company, has also given his order for the equipment of two new parlor and drawing-room cars on the New York & Albany line. Altogether, the outlook in this direction is the brightest, as well it might be. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Feb. 28, 1887.

The Malden, Mass., Electric Light Company commenced operations in the neighboring town of Medford on the evening of Feb. 12.

Mr. Oren S. Knapp and other residents of Somerville, Mass., have incorporated the Somerville Electric Light, Heat and Power Company, with a capital stock of $25,000.

The Edison United Manufacturing Company, through its New England representatives, Messrs. Paine & Francis, is installing a central station incandescent plant for the Sanford (Maine) Electric Light Company; also an isolated incandescent plant at the factory of the Ludlow Manufacturing Company, Ludlow, Mass.

An effort is being made to introduce the Thomson-Houston system of electric lighting into North Brookfield, Mass. It is calculated that a plant could be established for $6,000. The 110 oil lamps now used to light the streets can be replaced by twenty-five electric lights of 1,200 candle-power each, and the street lighting will be much more satisfactory. An article will be put into the warrant for the annual town meeting to see if the town will vote to put in the electric system.

A dispatch from Leominster, Mass., under date of Feb. 11, gives the following account of a new and important invention: Mr. F. E. Kinsman, of this place, but at present a resident of New York, has long experimented with electrical appliances, and has evolved that which, if successful, as it probably will be, is destined to create a marked sensation in the scientific world. He has had patented in this country and in Europe an automatically working device which signalizes the following: The approach of a train from ahead or in the rear; an open switch or draw; a broken rail or washouts; difficulty with any portion of the road which will tend to break the electric current established; in fact, almost any cause that can lead to an accident through difficulty with the line of the road.

The new idea is practicable, the inventor claims, upon either a single or double track. By this new idea notice of impending danger can be served upon a train at any point from a train's length to a distance of two miles. It so acts that no signal is given the engineer, but there is an immediate action upon either the air brakes or steam supply, or both, if the exigency of the case demands.

It is further claimed that the idea is thoroughly feasible and practicable; that the old signal systems will be displaced, as the new device covers all the points which they can include. All the mechanical attachments or action do not extend beyond the engine, and the work is all performed independent of the engineer.

The Standard Electric Time Company is the name of the concern that has been recently organized at Waterbury, and which has purchased the plant there and also the Warner plant of the town of Derby. C. D. Warner, of Ansonia, the patentee of what is known as the Warner system, is the general manager, with George W. Chapman, of Waterbury, as assistant manager. The object of the company is to introduce the electric time system into all of the leading cities of the State and to control the system wherever used. The general headquarters of the company are to be located in New Haven, whither Mr. Warner will remove from Ansonia. In the near future plants will be started in New Haven, Hartford and Bridgeport. Wealthy capitalists are backing the project.

The Massachusetts Institute of Technology (Boston) has petitioned the legislature for an appropriation from the State treasury of $200,000 for the further endowment of the School of Industrial Science. It is hoped that this petition will receive a careful consideration and a speedy concurrence to the request therein by the legislators of the great and progressive Bay State.

The Wakefield Board of Trade has engaged M. M. M. Slattery, the superintendent and electrician of the Sun Electric Light Company of Woburn, to deliver a lecture on "Electricity and the Electric Light" at the rooms of the board at an early date.

At Lowell for the past week some rascal has been defrauding boys from eight to ten years old by representing himself as an agent of the Baltimore & Ohio Telegraph Company, and pretending to engage them as messengers, collecting $2 each as a deposit for uniforms.

The telephone rate agitation has been revived here, and the Committee on Mercantile Affairs has been regaled with more testimony to prove that the rates are too high. A bill to fix low rates has been introduced to notice.

Mayor O'Brien is still waging his fight with the Board of Police, and has now ordered some of the new signal boxes out.

I find I was in error in stating the other day that Mr. C. J. H. Woodbury would speak at the National Electric Light Convention on thermostats. I had the "point" from good sources, but Mr. Woodbury entertained no such idea, he tells me, although he believes that thermostats are going to take a very important position in displacing watchmen in the protection of large buildings. I think the public generally would, after all, very much appreciate something from Mr. Woodbury on that point.

Mr. J. H. Howard, of the Tropical American Telephone Company, said to me last week, in reply to my inquiry as to what the company was doing:

I find by looking up the facts that this company has furnished the following sets of instruments to the telephone companies below:

Since November, 1884, when we sold our Barbadoes plant, 105 sets; making with the instruments then on hand (250), 355 outfits.

Since April, 1885, when we sold our Trinidad plant, 237 sets; making with the instruments then on hand (150), 387 outfits.

Showing an increase of 105 subscribers in the former, and an increase of 237 subscribers in the latter.

To the Guatemala Telephone Company since 1884, 234 outfits.

To Kingston, Jamaica, Telephone Exchange, 156 outfits.

To Caracas, Venezuela, since 1885, 75 sets, making a

1. Total of 735 subscribers in present Venezuela system.
2. Total of 387 subscribers in present Trinidad system.
3. Total of 355 subscribers in present Barbadoes system.
4. Total of 234 subscribers in present Guatemala system.
5. Total of 156 subscribers in present Jamaica system.

The Companhia Union Telephonica do Brazil had in

Rio de Janeiro, April 1, 1886	1,247	subscribers
Sao Paulo Exchange "	233	"
Santos " "	122	"
1. In the system	1,605	subscribers

There were in 1884 in

Pernambuco, Brazil	270	subscribers	Using "Bell" insts.
Bahia, "	240	"	
Para, "	70	"	
Campinas, "	140	"	
	720	"	
Brazil system, total	2,325	paying subs.	

2. In Buenos Ayres:—

The United River Plate Telephone Company, Limited, the successor to the United Telephone Co. of the River Plate, Limited, Bell Insts., and successor to the River Plate Telephone and Electric Light Company, Limited, Gower-Bell insts., by consolidation just effected had, Dec. 15, 1886, a total of 3,548 subscribers.

3. In Havana, Cuba.—The Campanhia Electrica de Cuba has 325 subscribers, paying $8.50 gold per month.

The government telephone line connecting the signal station at Vineyard Haven with Gay Head (M. V.), was put in working order on February 9. Vessels wrecked hereafter at Gay Head or vicinity and requiring assistance will find the telephone "a friend in need;" by communicating with Vineyard Haven a steam-tug or wrecking vessel can be procured. Arrangements are to be made soon for regularly displaying cautionary signals at or near the Gay Head light-house.

A report comes from Portsmouth, N. H., that the electric light company of that city is on the eve of erecting a new building, which will probably be the largest of its kind in New England outside of Boston.

Mr. Louis J. Magee, for some time past in the employ of the Thomson-Houston Electric Company, has been appointed superintendent of the electric light station in Lima, Peru, S. A., and will leave Boston early in March. Mr. Magee states that he is well pleased with his new position, and that although going among strangers, the influence of the company he represents will insure him a warm welcome and many friends. The Lima plant is in a prosperous condition, and has a very encouraging outlook. It uses the Thomson-Houston system of arc lighting.

The directors of the Municipal Signal Company, of Boston, met on Wednesday, Feb. 23, and elected as officers: President, Col. A. A. Pope, Boston; treasurer, John C. Wilson, Boston; clerk, Charles E. Batchelder, Portsmouth, N. H.; assistant clerk, L. M. Palmer, Boston.

On Friday evening, Feb. 25, the Boston Society of Arts held its regular meeting at the Massachusetts Institute of Technology, and a paper on the Bessemerizing of copper mattes was read by Dr. E. D. Peters, of Walpole, Mass. For the benefit of non-professionals, the description of the Bessemerizing invention was preceded by a brief account of the ordinary methods of copper smelting.

There is a rumor current in Boston to the effect that a change will soon take place in the office of the N. E. superintendent of the B. & O. Telegraph Company, and that Mr. J. W. Larish will succeed Mr. C. J. Sheehan.

The owners of the schooner Bertha M. Miller, of this port, which vessel fouled the French cable on Brown's Bank, off the Massachusetts coast, losing part of her cable and her anchor in order to save the cable, received on Feb. 25 the sum of $125 as reimbursement, from Superintendent Fisher.

The annual meeting of the stockholders of the Billings & Spencer Company, of Hartford, was held Feb. 21. The old board of directors as re-elected, viz.: C. E. Billings, Dr. H. P. Stearns, C. M. Spencer, M. W. Graves, L. H. Holt, Silas Chapman and E. H. Stocker. At a subsequent meeting of the directors C. E. Billings was chosen president and superintendent, L. H. Holt, treasurer, and E. H. Stocker, secretary. The business outlook for the year was shown to be very promising.

The Cunningham Iron Works Company, Charleston, Mass., have recently fitted up their office in a neat and thorough manner. The office is connected with their extensive works.

Last Wednesday, Feb. 23, the immense engine in the new mill of the Coe Brass Company at Torrington, Conn., was started up for an experimental trial, and it worked finely. The engine is a compound one of the Corliss patent, made by the Watts-Campbell Company of Newark, has a twenty-ton balance wheel, and is rated at 400 horse-power, with an easy capacity of 500.

The Massachusetts Lord Acoustic Telephone Co., Boston, having secured from the parent company at Portland, Me., the control of the patent for this State, are now successfully introducing the Lord acoustic telephone for all sorts of purposes.

At the dinner of the Commercial Club, on Feb. 19, the subject for discussion was announced to be "Electricity and Its Applications." The "Theory of Electricity" was discussed by Prof. Charles R. Cross; "Telephony," by Mr. W. W. Jacques; and "Applications of Dynamo-Electric Machinery," by Prof. Elihu Thomson. About 75 gentlemen were present, and listened with close attention to the remarks of the scientific gentlemen.

The Rhode Island Electric Lighting Company, of Providence R. I., whose station was recently visited by fire, caused by explosion of carbonic acid gas owing to poor combustion of bituminous coal (which was being temporarily used) is rapidly getting its business into its regular routine and former shape. In an interview recently with Supt. John I. Drake, my interlocutor said: "As to the origination of the fire, we feel satisfied as to the gas theory. Everything about the dynamo room was burnt and charred, just the same; but no one thing entirely consumed except the leather belting. The loss by fire amounted to very little; but the unfortunate loss of the engineer and fireman is irreparable. We were detained by the coroner about three days, and the insurance men had to have their time; as it was we had part of our city lamps running on the 20th ult., only five days after the fire. On the sixth day we ran all our city lamps, and on Saturday, the seventh day, we had the city circuits and two of the commercial circuits in good running order. To-day (February 5) the carpenters and painters leave us; and, as you can readily observe, we are in almost as good condition as previous to the fire, and equally as well prepared as ever to give satisfactory attention to our old customers, and furnish lights to new ones. We are running at present 208 arc, 600 incandescent, and 120 'Mogul' (125 c. p.) lamps. The dynamos, excepting two, are uninjured; in fact just as good (after having a little touching up by the painters) as before the fire. New machines are now on the way to replace those injured, and others to increase the lighting capacity of our plant, and indications point to a finer looking and better equipped station than before the sad occurrence in January."

Apropos to the foregoing, the Boston *Commercial Bulletin*, in its February 5th issue, contains the following interesting editorial: "The fire at the Providence electric lighting station, which was attended with the loss of two lives, was indirectly caused by the coal handlers' strike at New York. The company was deprived of the anthracite coal which it had heretofore used, and was geting along temporarily on bituminous. At about 3 o'clock in the morning the fireman had banked up the three of the furnaces, and was preparing to treat the fourth fire in the same way. Ignorantly he left the damper nearly closed, as he was in the habit of doing with hard coal. The result was that he made virtual gas retorts of the furnaces, and in poking the fourth furnace with a slice bar he caused a puff of flame which ignited the gas and cost him his life and the engineer's also. The gas, which was something of the nature of crude illuminating gas, and not of the right mixture to be explosive, rushed into the top of the dynamo room, where it burned fiercely, destroying belting and injuring the timbers. The gas also found an outlet to the next room, and passed completely through that story, doing no damage to the attic, where it burnt itself out and set fire to the roof. There were about 75 looms in this attic running on cotton yarn which were not damaged at all. The total loss to the building (and the other loss is small) will not exceed $5,000. The very pointed lesson of this peculiar fire is that there will surely be trouble where bituminous coal—which is, by the way, the best and cheapest steam coal for general use—is burned in the same way as anthracite."

Mr. W. J. Hammer, the manager and electrician of the very successful Edison station in Boston, has positively covered himself with glory by his electrical lecture and entertainment given on Feb. 19 as one of the Boston Y. M. C. A. course. The Union Hall was jammed to overflowing, and Mr. Hammer will in all probability have to respond to an "encore." The apparatus on the stage was as comprehensive as it could possibly be, and they tell me that more "experiments" were shown than were ever attempted before on any such occasion. Mr. Hammer did everything except turn dirt and water into food, and I think he would have done that too if he had had time. At any rate, his audience gave him credit for ability to achieve any feat that he set his mind on, and the place literally howled again with cheers and laughter as he proceeded from stage to stage of his talk and illustrations. The lecture, which bristled with good points, was preceded by a solo on an electrical piano, and closed with a veritable dark seance, during which a skull danced the can-can and the electric band gave forth diabolical music. Altogether, Boston has never had such a sensation of the kind, and would very much like to be thrilled again in the same way. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., Feb. 28, 1887.

At the annual election of the Applegate Electric Mat Company, which was held at Camden, N. J., Feb. 5, the directors for the ensuing year were elected.

The Atlantic City Council has decided to light the beach front, along the board walk, with electric lights, beginning March 1, instead of June 1, as heretofore.

The Keystone Light and Power Co., who have had a central station in successful operation since September, have rented very nearly all their present capacity, and have been compelled to call a meeting of directors as the following will show: "Notice is hereby given that pursuant to a resolution of the Board of Directors a meeting of the stockholders of The Keystone Light and Power Company will be held at the company's office, No. 108 South Sixth street, Philadelphia, on the 6th day of April, 1887, at 12 o'clock noon, for the purpose of voting for or against increasing the capital stock of said company from one hundred thousand dollars to one million dollars, the said increase of nine hundred thousand dollars to be divided into eighteen thousand shares of a par value of fifty dollars each. H. H. Westinghouse, President."

A lecture was delivered at the Franklin Institute on the evening of Feb. 11 on "Electricity and the Different Forms in which it Manifests Itself," by Mr. Carl Hering. He exhibited a Franklin and a Holtz machine which were in use at the beginning of the electrical era, and told of the vast improvements made since that time, and enlarged on the manifold uses to which this wonderful agent has been applied. Mr. Hering gave some fine practical illustrations. The current used for some of the experiments was supplied from the Keystone Light and Power Company's central station, on Sansom street.

Partrick & Carter, 114 S. Second st. are very busy. They are about introducing several entirely new specialties, among them being a push button and thermostat combined, and a new form of iron-box bell. They have also something which is entirely new in the bell line, this being an indicating box bell. It is arranged with a needle on the cover so that when the bell is rung the needle will indicate, thereby showing the attendant that he is wanted; supposing him to be absent when the bell rang, the call will remain indicated. This firm are about getting out illustrated sheets of their specialties, which will be sent to the trade on receipt of business card.

The next Mayor of Philadelphia, Hon. E. H. Fitler, is the uncle of Mr. A. F. Moore, the insulated wire manufacturer.

Information concerning electric things and doings will not take shape in the simple forms that make up the vocabulary of the general markets. So many developments are unexplainable to

the common reader, and so many are hidden away in the inventor's or manufacturer's mind, just when we seek them, that it is often difficult to procure information first hand.

One of the most industrious of the electric enterprises of Philadelphia is the Cleverly Electric Works at 1018 Chestnut street. During the six or seven years of their labors here they have gone a great way toward the universal introduction of their "Pinkham Electric Gas Burners" throughout the city, having supplied several thousand houses with burners, ranging from 10 to 200 per house. It is very rare that its introduction into a house, including the battery, running of wires, fixing touch buttons, fitting the requisite number of burners, etc., etc., costs less than $100, and it is cheap at that. Messrs. Widener & Elkin are building a house on North Broad street, in which the Cleverly electric fittings and fixtures will cost $3,600.

The Keystone Light and Power Co. are busy as ever putting up extensive plants. Last week they furnished one consisting of a 300-light Westinghouse dynamo and 45 h. p. Westinghouse engine, for the works of the Standard Steel Company, at Logan, Pa. There are 18 lamps of 150 candle-power for mill and outside lighting, and very good results have been attained by setting these lights 90 feet from the ground, under reflectors simply painted white and varnished. The lights used about the machinery and offices vary from 16 to 50 candle-power.

As a result of the Temple Theatre fire, or rather of the very clear explanation by Inspector McDevitt of the danger of careless or improper electric lighting, and of the perfect safety if properly fitted, and with the adoption of proper precautions, the Central Theatre, in Walnut above Eighth, is now being wired by the Keystone Company for nearly 300 lights, to be operated from their station.

The Fort Wayne Jenney Company have just secured through their general manager here, Mr. G. A. Wilbur, the contract of putting in 200 arc lights in the retail dry-goods establishment of Strawbridge & Clothier at Eighth and Market streets. The wiring has been done for the entire work, but at present only 30 lights will be placed. This well managed and enterprising Western concern walked in and took this large order over all our local concerns and those of New York. The above firm will put in a new steam plant. There will be four circuits. The chief inspector has pronounced the work done so far a fine job.

The electrical interests generally are elated at the favorable indications for business. Councils are quite liberal. Much electric lighting will be done this season. Outside towns and cities are studying the problem with deep interest, and our electrical interests are striving, as they do every where, to meet all the requirements.

The recent convention gave an impetus which will not be soon lost. The work accomplished will be permanent. Capital is not halting now when such opportunities are presented for investment as were pointed out a couple of weeks ago.

The supply houses are all doing a fair business. Trade and manufacturing prospects are improving. All the mills and factories are busy. The heavy industries are overcrowded, and in many cases are sold ahead for six to eight months. Enterprise is stimulated everywhere. Railroad building will be prosecuted actively and vigorously all year. House, mill and shop building will be active in this city.

PENNSYLVANIA NOTES.

UNIONTOWN, Pa., Feb. 19, 1887.

Electrical dealers Messrs. McCoy & Frost, of this city, have just fitted up the Marietta Hotel with a 30-drop annunciator, return call and switch fire alarm; also the Smith House with a 30-drop annunciator, both apparatus made by Hazazer & Stanley, of New York. This firm has also completed a system of electric signals in the Merrell coal mine, owned by the Cambria Iron Company, of Johnstown, Pa. The length of line is 3,300 ft. from the engine rooms to lower level at bottom of mine, a double track is used the whole distance, and the signals are universal. The two electro-mechanical gongs of large size are used in the engine house, with dust proof cases; the return signal keys are placed convenient to the engineer. The return signal bells are 5 and 6 inch cast gongs, coils wound with silk-covered wire, filled and covered with a strong waterproof insulation, then inclosed in heavy cast-iron boxes, which are also well insulated. The conductor, of which nearly 10,000 feet was used in this installation, is 16 B. & S. gauge, $\frac{3}{32}$ insulation; every splice was soldered, coppered and taped. The wire is of high insulation, being furnished by the Callender Insulating and Waterproofing Company. McCoy & Frost insulated each wire on separate insulators, so as to give as near a perfect insulation as possible.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Feb. 26, 1887.

I have endeavored, ever since the Central Union troubles began in Indiana on account of the reduced rate law, to keep your readers thoroughly posted on telephone matters in that State. The practical operation of a reduced telephone rate law in Indiana has offered an opportunity of judging whether it is in reality possible for a company to give a good and satisfactory service in return for so small a remuneration. I have always held that this was not possible, and have frequently predicted, as a reference to this column in back numbers of the paper will show, that sooner or later the bill would be repealed. Inasmuch as a repeal bill has just passed the Lower House of the Indiana Legislature, it seems probable that my predictions will soon come true, and that the Central Union Company in Indiana will shortly be able to get a living rate in return for its service in that State. If this repeal bill should not go clear through, it will be because it will fail of the Governor's signature, for having passed the house, it is sure to pass the senate, as this latter body has never evinced as much hostility toward the company as has been shown by the house.

Notwithstanding the fact that Indiana has, as a result of the trial and probable rejection of a low rate law, furnished to other states ample evidence that a good service and a poor rate cannot go together, there is prospect of a lively telephone fight in Chicago, unless the rate bills now before the legislature are shelved in the near future. The telephone company is buckling on its armor preparatory to a fight against a measure which, its officers claim, will destroy it. This is Senator Cantwell's bill limiting the charges of telephone companies to $4 per month where one instrument is used and $3 each where there are two or more. If Senator Cantwell's bill should become a law, Illinois will see what Indiana has seen, namely, an indifferent service for a couple of years or so in the larger cities, and none at all in the smaller towns. This will be followed by the repeal of the low rate law, and this repeal will be hastened, as was the case in Indiana, by memorials from all over the State.

The Indiana Legislature, while showing a disposition to let up on the Central Union Company is, nevertheless, still reaching after the American Bell Company, its latest inspiration being a tax which it proposes to levy on each telephone instrument. As the American Bell Company owns, of course, all the instruments operated by the Central Union Company, the legislators think they see an opportunity of levying tribute on the American Bell Company to the extent of one or two dollars for each instrument.

In my last letter I mentioned that the Western Electric Company had received orders for an increase of 180 lights for the town of Lake (Ill.) Gas Company. I have now to record a still further increase of 30 lights. This will make the plant consist of 380 Western Electric lights. Another large order which the Western Electric Company has just received covers the apparatus for a 200-light plant to go to Toledo, O.; and still another, a 60-light plant, for Scranton, Pa. Among the gas companies using the Western Electric system, I am able to recall the following: Sandusky (O.) Electric Light and Fuel Gas Company; Alliance (O.) Gas Company; Town of Lake (Ill.) Gas Company; Visalia (Cal.) Gas and Electric Light Company.

Mr. Geo. F. Durant, of the Bell Telephone Company of Missouri, has just put in an order for some more Patterson aerial cable.

The Kansas City Electric Street Railway Company seem to be highly satisfied with the recent trials which they have had on their road. An overhead wire is used. The line of the road is from the corner of Fifth street and Grand avenue directly east to Lydia avenue. One train will be run at first, but the company expects to put on four trains as soon as possible. Each train will consist of the motor car and a passenger car. The motor car will carry thirty-six passengers, and the passenger car about the same number. Each car will be in charge of a conductor and a "motorneer." The speed will be about seven miles an hour. The cars can be stopped within a distance of six feet, if necessary. Brakes will be used on the wheel, and the motor itself can be made to act as a brake by reversing its motion. The company has sold the right to operate a line in San Diego. The road there will be very long, the total length being twenty miles. The electricity will be generated by water-power instead of steam. The company is also in correspondence with Los Angeles parties.

The city authorities of Warsaw, Ind., have just closed a contract with the Electric Light Company of that place, which heretofore has only furnished light to private business houses, to put up twenty-five street lights. This, with the seventy gas-lamps they have at present, will make Warsaw a well-lighted town.

The now well-known Synovial oil is very popular among the electric light people as a lubricant. Agent Taussig, at 43 River street, this city, finds his sales rapidly increasing.

I have just learned that the Heisler Electric Light Company have sold, since my last visit to St. Louis, 1,400 30 candle-power incandescent lights, with accompanying apparatus, to go to Utah Territory; 700 of these lights go to the Salt Lake Power, Light and Heating Company, of Salt Lake City, and the other 700 go to the Ogden City Electric Light Company. It might perhaps be said that the electric light in Utah represents more than anywhere else the cause of progress, the Gentile against the Mormon, for the gas interests of the territory are entirely in the hands of the Latter-Day Saints. These 1,400 lights are only the entering wedge, as, in case the lights give as good satisfaction as they are undoubtedly giving in other places, it is expected that very large installations in each of the cities named will be the result. The Heisler light has not been adopted for these cities without thorough investigation.

Mr. David Walker is president of both the Ogden and Salt Lake Companies named above, and this gentleman, in company with Major V. M. Silva, manager of the Ogden Company, went to St. Louis and made a thorough examination of the apparatus employed and the service rendered by the St. Louis Illuminating Company, which also uses the Heisler system. That they were entirely satisfied with the apparatus, service and financial results of the St. Louis company is evidenced by the fact that on completing their investigations they gave their order for 1,400 lights.

It is worthy of notice that the Ogden plant will be run by water-power five miles distant from the city. The conductor used for transmitting this power to the city will be No. 9 hard-drawn copper.

The Electrical Supply Company, 171 Randolph street, Chicago, are constantly adding to their already pretty complete line of electric supplies. Their latest is the introduction of chromic acid for use in primary batteries. Heretofore, as is known, the bichromates of potash, soda, etc, used in batteries, needed a profuse use of sulphuric acid to set free the chromic acid. The Electrical Supply Company are sole Western agents for this chromic acid, which is manufactured in England. Electric light supplies of every description are kept in stock by this company at 171 Randolph street. You described their new electric light switch-board in an illustrated article in your issue of Feb. 12. Manager Terry informs me that these switch-boards give the best of satisfaction, and that they are selling rapidly. The Wirt voltmeter, also handled by this company, is popular and is said to be one of the best and most reliable voltmeters on the market. There are no permanent magnets, and it is claimed to be absolutely correct. This instrument can also be used to measure the insulation of the circuits. Construction tools, poles, cross-arms, underwriters' line wire, cables, magnet wire, cut-outs, ammeters, speed indicators, brush copper, pins and brackets, insulators, cleats, the well-known Wallace diamond carbons; in fact, a complete line of local light companies' supplies are handled and promptly shipped on orders. The Electrical Supply Company's Chicago house has only been established about two years, but, thanks to an energetic and capable management, the business has already assumed proportions which would have been considered highly satisfactory if they had been reached at the end of five years instead of in two.

Among the specialties manufactured by Mr. H. A. Streeter, proprietor of the Globe Iron and Electric Engineering Works, 35 to 41 Indiana street, this city, are the Amet electrical governors for steam or water motors. This governor is purely automatic and instantaneous in its action. It maintains a uniform current and economizes power and carbons.

The Amet brush adjuster is applicable to all Gramme machines designed to be controlled by the movement of the brushes. The Amet current indicators, ammeters and voltmeters are said to be extremely sensitive and accurate. Each instrument is calibrated separately, and thoroughly tested before being sent out. The Amet head-light hanger, which enables the pilot to focus the rays of light in any desired direction, is largely in use on the Mississippi River steamboats. The Amet lightning arrester is automatic in its action, and sets itself after every discharge. It is claimed that this arrester has more surface than any other made. The claim is made for the Amet ground detector and signal that it at once detects the slightest leaks in the line, and signals dangerous grounds to the station.

It will be seen from the above (and I have not named them all) that Mr. Streeter's company manufactures quite a line of excellent specialties, all of which are useful and practicable, and for which there is a constant and growing demand. The orders for these goods are received from all over the world, even from as far away as Australia. As a matter of special interest I will mention that one of the Amet governors has lately been furnished to the Cowles Electric Smelting and Aluminum Company, Lockport, N. Y., to take care of the monster Brush dynamo in use by that company. You will remember that you lately illustrated this dynamo and plant, and I believe that it is the largest dynamo in practical use in the world. The employment of the Amet governor in connection with the dynamo does away with the constant service of one man. This governor is becoming more and more popular as electricians become better acquainted with its merits. This remark is also applicable to the other specialties manufactured by Mr. Streeter. Some of these you have already illustrated.

The general superintendents of the different telegraph companies in Chicago, though they had not examined the postal telegraph bill, presented in the senate lately, closely, are not in favor of it. Col. Clowry, of the Western Union, said recently he had only glanced at the bill as reported in the newspapers, and therefore he did not care to express a decided opinion on the subject. He did not think the operating of the telegraph system by the government would be satisfactory to the general public. The doing away of opposition would do away with a great deal of the efficiency of the service. Business men wanted rapidity, and there were some twelve private wires in use by business men between Chicago and New York. Of course, by the act of 1866, the government had the power to buy the lines if they wished to, the price being fixed by an arbitrator appointed by the government another by the telegraph company, and those two to appoint a third. The government have already the right of way for their messages, and paid extremely low rates for them.

Mr. J. E. Zeublin, general superintendent of the Baltimore & Ohio, said he had read the bill as reported in the papers, and did not think it would be for the benefit of the public. The establishment of telegraph offices in all the post-offices would not be so convenient as the different offices now scattered through the city. At present each section where a certain business was located had its office, like the sugar business on Wabash avenue and Water street, or the dry goods business in its section. The Board of Trade men would not rush to the post-office to send messages, and besides, as in all governmental institutions, there would be a certain amount of red tape which would cause delay. As to the rate fixed, the Baltimore & Ohio was already carrying messages at a lower rate. He did not think the system had worked well in England. He supposed, however, as there had been so much agitation about the government taking hold of the telegraphs that the experiment would be tried, but he did not think it would be successful.

Mr. L. D. Parker, general superintendent of the Postal Telegraph, said he had not examined the bill, but he was opposed to the government taking hold of the telegraphs. It was against the interests of the public. Persons using the telegraph were business men chiefly, and they wanted prompt dispatch. Without opposition, and in government hands, a satisfactory service could not be obtained.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$155@$157
Chicago	375@ 400
Central Union	51@ 52
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Michigan	71@ 73
Rocky Mountain Bell	40@ 45
Wisconsin	104@ 106

W. A. K.

THE TELEGRAPH.

Buffalo, N. Y., has the underground wire craze, but the wires are likely to stay up for some time to come.

St. Louis Bucket Shops.—The Merchants' Exchange of St. Louis is pushing a bill in the Missouri Legislature to crush out the bucket shops.

The French Cable.—The Western Union Company has sent a diplomatically evasive reply to the demand of the French cable company for its land wires.

Western Union Gossip.—It is said that the Western Union Company is doing a heavier business than usual, some offices that earned only $150 last year showing up to the extent of $4,000 and $5,000 this. Resumption of dividends is predicted for July.

Taxing Telegraph Companies.—The bill for the taxation of telegraph companies has passed the Dakota House. This bill provides for the taxation of this property as the property of individuals, and that the tax shall be 60 cents per mile for the first wire, 30 cents per mile for the second, and 20 cents per mile for each additional wire. It provides in addition that telegraph companies must take out a license, and a failure to pay the tax abrogates the license.

The New York & Southern.—At Albany, N. Y., on Feb. 26, the New York and Southern Telegraph Company was

incorporated with a capital of $1,000,000. The lines are to run from New York to Jersey City, Philadelphia, Baltimore, Washington and New Orleans. Shares are all held by James B. Pace, 3,500; John S. Wise, 1,000; Thomas M. Logan, 1,000, Richmond, Va.; John G. Moore, of New York, 4,000; J. Seaver Page, of New York, 500.

The Cable Fight.—Mr. George G. Ward, general manager of the Commercial Cable Company, has come out with a circular in which he rather neatly convicts Mr. John Pender of insincerity in regard to the alleged reasons of the pool for making a 12-cent rate. It will be remembered that the pool claimed that the reduction was simply carrying into practice a carefully matured plan to establish low rates, but Mr. Ward quotes Mr. Pender's own words, uttered a week or two ago, showing the very contrary to have been the case.

The Ticker Injunction Vacated.—About a year ago the Commercial Telegram Company obtained an injunction to restrain the New York Stock Exchange from interfering with its enjoyment of floor privileges necessary to obtain quotations for its ticker service. The injunction has now been dissolved by Judge Ingraham in the Supreme Court Special Term on the ground that the Exchange is a private body at liberty to do as it pleases. "A court has no power to compel such an association to allow persons without its consent to enter upon or use the property of the association for their benefit."

Stock Exchange Ticker Service.—One of the questions occupying the attention last week of the Governing Committee of the New York Stock Exchange was the telegraph service of the Exchange. The organization is by no means a unit in the desire to give Western Union full control of the service, yet this will be the case if the committee decides to accept the offer of the Gold and Stock Company, which would be glad to pay not only its own rent but that formerly paid by the Commercial Telegram Company. The latter professes a willingness to double the figures of the Gold and Stock Company, to pay two years' rent in advance, and to give bonds for the payment of its rental for as many years as the Exchange cares to name. Each company has its advocates, but many members of the Exchange are not in favor of a monopoly, and prefer that the telegraph service be in the hands of a couple of companies at least. The committee postponed a decision in the matter.

THE TELEPHONE.

Tennessee.—The State Senate has rejected a bill based on the Indiana law.

New Jersey is trying its hand at burying wires and limiting telephone rentals.

Massachusetts has been canvassed for signatures to a petition calling on the Legislature to fix lower telephone rates.

Consolidation.—The Bell Telephone Company of Canada has bought out the Manitoba Telephone Company of Winnipeg.

New England Earnings.—The net earnings of the New England Telephone Company in 1886 were $257,516; the construction account was $37,919, leaving a balance of $220,097 as compared with a net balance in 1885 of $184,018.

The Lowell Syndicate Suits.—The Massachusetts Supreme Court full Bench has sent down a rescript in the cases of William H. Bent, Loren N. Downs, and William A. Ingham against the Erie Telegraph and Telephone Company affirming the judgment of the Superior Court, which rejected the award of the arbitrators who heard the case.

Newark, N. J.—The Supreme Court, on Feb. 17, at the suit of the Domestic Telegraph and Telephone Company, declared illegal the resolution adopted by the Common Council giving the Citizens' Telephone Company the right to erect poles and proceed with work without being organized under the general telegraph law, the Citizens' Company being organized simply under the law authorizing corporations.

Austrian Infringement.—Gen. Barney, in his last telephone bulletin, says: "The Vienna *Electro-Techniker* states that the Consolidated Telephone Construction and Maintenance Company and the Telephone Company of Austria have met with a severe rebuff at the courts in Austria. The first named company had lodged an action for annulment of the patent of Prof. Alexander Graham Bell, in order to protect its Austrian establishment. This action, like many others, has now been dismissed with costs by the Austrian judicial authorities. As in England, the Bell patent remains consequently in force in the dominions of the Austrian monarchy, and the Telephone Company of Austria being infringers of that patent, will have to reckon with the patent owners."

Output of Instruments.—The following are the figures of recent output of Bell instruments:

Month Feb 20.	1887.	1886.	Increase.
Gross output	3,405	3,223	182
Returned	1,918	1,408	510
Net output	1,487	1,815	*328
Since Dec. 20.	1886-7.	1885-6.	
Gross output	7,379	6,003	1,376
Returned	3,874	2,956	918
Net output	3,505	3,047	458

* Decrease.

Bell vs. the Globe Company.—Judge Wallace heard argument in the United States Circuit Court, Equity Part, last week, in the application of the Bell Telephone Company against the Globe Telephone Company, for an injunction restraining the Globe Company from making, using or selling telephones in violation of the Bell patents. The Globe Company filed an application in September, 1885, to have the Bell patent vacated. The Bell Company sought to get an injunction against the defendants, which was denied a year ago by Judge Wallace. He held that the defendants had the right to petition the Government to vacate the Bell patents, the right to make all necessary experiments to test and to procure instruments that would not infringe on the Bell patents, and that they had a right to prosecute a claim of priority over Bell in the Patent Office.

Drawbaugh Stock.—The Boston *Evening Transcript* of recent date says: A sale of fifty shares of Drawbaugh Telephone stock was made at 60 Monday. The company is capitalized at $3,000,000, and the par value of the stock is 100, although it was originally 1,000, the number of shares having been but 3,000 at first. It is surmised that somebody may be hedging on the result of the suit now trying in Washington. Should the Drawbaugh Company win, its stock would probably jump high enough to make its purchaser a good return for his confidence; should it lose, Bell stock would surely advance materially. In either event, the hedger might make a good average. But nobody on the street seems to look for a different result of this suit than of all the former ones. The Bell company's case has the prestige of a long succession of victories and its position is too strong to be successfully assailed at this time, as it has proved to be in the past. The late attempt to bear Bell stock came to a quick termination although the point was pretty well distributed around the street that a bear raid was coming. The bull movement which followed, and is now in progress, showed that believers in Bell telephone were not a whit dismayed, and were as firm as ever in their confidence in the company's position and the value of its stock.

THE ELECTRIC LIGHT.

Decatur, Ala., is to have the electric light.

Washington, Kan., is to be lighted by electricity.

Trieste.—The harbor of Trieste is now lighted by electricity.

Rome, Ga., has a new electric light plant under consideration.

West Grove, Pa., is expecting a plant. Mr. E. B. Gauthrop is interested.

Cairo, Ill., is to have an electric light plant put in by E. W. Halliday and others.

Colebrook, N. H.—Mr. G. S. Morris is to put in an electric light plant at this place.

San Antonio, Tex., talks about an electric light plant being supplied from St. Louis.

The German Edison Company will increase its capital from 5,000,000 to 7,000,000 marks.

Goldsboro, N. C.—The Goldsboro Water, Gas and Electric Light Company is to be incorporated.

Easton, Md.—Mr. P. S. Reed is the president of a company to put an electric light plant in this place.

New Rochelle, N. Y.—The New Rochelle Electric Light Company has been incorporated by W. R. Bergholz and others.

Henderson, N. C.—The Henderson Gas and Electric Light Company has been incorporated, and will begin operations immediately.

Westfield, Ill.—The Westfield Electric Light Company, lately incorporated by W. A. Chase and others, has a capital stock of $25,000.

Philadelphia, Pa., City Councils have appropriated $25,000 to extend the electric light service, and have ordered 155 new lights to be placed.

Pine Bluff, Ark.—The local gas company has bought out the franchise and plant of the electric light company, and will henceforth operate both systems of lighting.

Albany, N. Y.—The Electric Light Construction Company, Albany, N. Y., has been incorporated by Wm. Headlam and others, with a capital stock of $50,000.

Tampa, Fla.—The Westinghouse Company will put in an electric lighting plant of several hundred lights for Messrs. J. T. Lesley, R. A. Jackson and W. N. Conoley.

Richmond, Va.—The Old Dominion Electric Light and Power Company has been incorporated by M. B. Leonard, C. E. Wellford and others, with a capital stock of $50,000.

Montreal, Can.—A special dispatch from Montreal states that a municipal investigation is likely to take place there relative to electric light contracts and other similar matters.

Massachusetts Statistics.—According to the returns of the Gas Commissioners, there were at the time of their report 40 electric light companies in Massachusetts in active operation, with an aggregate capital of $3,500,000 and with a capacity of 5,500 arcs and 30,000 incandescents.

Chattanooga, Tenn.—The Brush Electric Light Company of Chattanooga has been reorganized. Mr. D. W. Hughes and other active business men there have purchased the plant and will at once increase its capacity. They have already ordered two 12 × 12 automatic engines from the Ball Engine Company, of Erie, Pa.

The Milan Cathedral.—Mr. J. W. Lieb, of the Edison Company, at Milan, Italy, writes us that the electric lighting of the beautiful cathedral at Milan was successfully begun on Christmas Day. The current is supplied from the Edison central station. The installation in the sacred edifice consists of 95 Edison lamps, 15 of 32 c. p., 3 of 16 c. p., and 77 of 10 c. p.

The Loomis System.—The Loomis Electric Manufacturing Company, New York City, N. Y., has been incorporated, with a capital stock of $100,000, by John Warner, Alonzo De Forest, Wm. L. Warner, Benj. Hay, Charles D. Thompson, George L. Stevens and James H. Hurst. The company has contracted to equip the factory of B. Hay & Co., woolen manufacturers, Cincinnati, with a lighting plant.

New Bedford, Mass.—The Edison Illuminating Company of New Bedford, Mass., has paid a dividend of 2½ per cent. This is one of the most successful Edison stations, and on the point of economy is the fifth in the list. It was installed by the Jarvis Engineering Company, of Boston, and it is to their credit that every Edison central station set by this system is on a paying basis, one company earning 24 per cent.

Another Big Batch.—The Hudson Light, Heat and Power Company, of Jersey City; the Camden County Light, Heat and Power Company, of Camden; the Passaic County Light, Heat and Power Company, of Paterson; the Warren County Light, Heat and Power Company, of Phillipsburg; the Newark Light, Heat and Power Company, of Newark, N. J., have been incorporated, with a capital stock of $100,000 each, by Caleb H. Jackson, Pittsburgh, Pa., and others.

Louisville, Ky.—A very circumstantial report, which we noted at the time, came recently from Louisville, as to grave damage done there to part of the fire alarm system through a cross with electric light wires. Mr. S. C. Dodge, superintendent of the local Brush Company, now informs us that it was not a cross with Brush wires, as alleged; that the fire alarm system has ten separate circuits, only one of which was affected; that the damage was very slight indeed; and that the danger to the gallant chief operator was at a minimum. "In fact," says Mr. Dodge,—and we can very readily believe him,—"the whole dispatch is full of gross misrepresentation."

Belvidere, N. J.—J. W. Starr, of Philadelphia, the contractor for the lighting of Belvidere, N. J., by electricity, has been trying to adjust the difficulty whereby his works were seized by the Sheriff in consequence of Starr's failure to pay for the labor performed and material furnished in putting up the works. The efforts to get the material out of Belvidere have failed, as the town authorities will not allow the wires to be taken down. The creditors have not yet agreed to Starr's terms, and Belvidere is still without light.

The Statue of Liberty.—The decision that President Cleveland and Secretaries Endicott and Fairchild have come to after carefully considering the matter is that the clause in the act authorizing the President to accept the statue as a beacon, imposed upon him the duty of placing the matter in the hands of the Light-house Board. This was done on Feb. 26, and Commodore Benham, the inspector of the New York district, at Staten Island, was notified to take immediate steps toward the lighting of the statue regularly. The cost per month, including every expense, it is thought will be about $900.

Newton, Mass.—At the last meeting of the Newton board of aldermen, the committee on fuel and street lights recommended that the city council authorize the committee to contract with the Newton Electric Light and Power Company to light the streets, as follows: The electric light company to furnish the city from March 1 to June 1 with 30 arc lights, not less than 1,200 candle-power, and 84 arc lights of the same candle-power from June 1, 1887, to June 1, 1888, said lights to burn every night from sunset to sunrise, for the sum of fifty cents per light per night. The report was referred back for some details.

The Opinion of the Gas Men.—The National Gas Association of New England managers, at its recent meeting in Boston, came to the conclusion that it was a good thing to sell the electric light as well as gas, the combination being desirable as well from the consumer's standpoint as from that of the producer. The opinion was expressed that by the use of the coke from the gas retorts to make steam for running the electrical apparatus and the employment of a single executive force to conduct the business, a saving of from 33 to 50 per cent. might be made in the production and service of both lights from a common centre.

Car Lighting.—The Northern Pacific Railway is constructing an iron car containing boilers for steam and hot water and electric machinery for lighting purposes. This car is to be attached to the train immediately in the rear of the engine and will furnish the steam necessary for heating a long train independent of the locomotive boiler. Its electric light apparatus will reduce the danger of fire from the use of oil or gas, and thus render the chances of a conflagration in case of a wreck very remote indeed. What the Northern Pacific can do in this respect any of the trunk lines may do, and some of them are already working in the same direction.

Scranton, Pa.—The Scranton Illuminating, Heat and Power Company, Edison system, began operations on Feb. 22, with subscribers for 3,000 lamps. The plant was designed and built by the Marr Construction Company, of Lewisburg, Pa., of which Mr. H. M. Doubleday is superintendent. The circuits cover the entire city, having 32 miles of copper in them. In the station the steam plant consists of 3 125 and 1 65 h. p. Ide engines. These engines are doing their work faithfully and well. The boilers are set with carbon burning grates, and steam draught. In the electrical work, Mr. Thos. Spencer, electrician of the Marr Company, has taken a new departure, in the placing of dynamos and electrical apparatus, and for convenience and appearance it cannot be excelled. The local company have adopted the Western Electric Company's arc system, and will soon have two 30-light machines running.

Milford, Mass.—Several months ago a number of enterprising Milford men subscribed $1,000 each, as an experiment, to put in electric lights. They purchased the boot shop formerly occupied by the firm of A. C. Mahew & Co., which they fitted up in a suitable manner, putting in a better engine, and a dynamo, and putting up a line of wire with several arc lights on the street and in several stores. These were run several months free of expense, giving so good satisfaction that the town voted to adopt the light and put in several new ones. The number will be increased at the next March meeting. The company soon put in the incandescent light, and the business has now grown so that they have increased their capital to $60,000, and have two eighty horse-power boilers, three engines, two of them sixty horse-power and one twenty five horse-power, and a new dynamo. They have over fourteen tons of wire in use, with 45 arc and 600 incandescent lights, lighting twenty-five stores, printing offices, barber shops, hotels, engine houses, etc. Several private residences also use them. The work was done in the best manner by the Brush-Swan Electric Light Company, of New England.

APPLICATIONS OF POWER.

Scranton, Pa.—One of the new electric roads at Scranton will run out to Dunmore. The capital stock is $50,000. Mr. G. Clark is President of the company.

St. Louis, Mo.—It is stated that the Electric Light and Power Company of St. Louis will apply their Trippe storage battery system to street car operation in that city at once.

Birmingham, Ala.—Messrs. Smith & Eastman have been making the surveys for the electric road to run three miles from the city out to their real estate near North Birmingham.

Selma, Ala.—The Selma Land Improvement and Furnace Company will build an electric street railway. Its capital stock is $3,000,000. Messrs. R. M. Nelson, W. Ullman and V. T. Vaughan are among the incorporators.

Sprague Motors.—The Sprague Company received orders last month for 36 motors, running up in most cases to several

horse-power, and shipped 21. This month the orders for the first two weeks were for 16 motors. Three 8 horse-power motors go to the Edison Company at Milan.

Detroit, Mich.—The Highland Park Company are so pleased with the Fisher electric motor apparatus supplied to them for running their street railway, by the Detroit Electrical Works, that they have already ordered two more passenger cars and one large motor capable of handling a train of three cars.

Broadway, New York.—General Wingate, counsel of the Metropolitan Rapid Transit Company, which proposes to construct an elevated road on Broadway, says that the company is only waiting a decision from the general term of the supreme court in its suit to obtain right of way before taking further steps. A decision is expected any day. Should it be favorable to the company, the General said that the work of building the road would be proceeded with at once. He added that the company had plenty of money to enable it to do so. General Wingate is of an inquiring turn of mind as regards electric motors, and appears to have little faith in cables.

PERSONALS.

Mr. T. A. Edison is declared to be far better in health than the newspapers allow, and to be rapidly recuperating at his Florida home.

Mr. Nathaniel Hucker, who works the State Associated Press wire in the office of the Buffalo *Commercial Advertiser*, is said to be the oldest telegraph operator in actual service, having been at the key for 40 years. He began in February, 1847.

Mr. E. H. Goff is an old and well-known insurance man, and the *Insurance Times* pays him the well-deserved compliment of printing a most interesting sketch of his life, accompanied by a well executed plate portrait. Mr. Goff's career is admirably told by one who knows him. It is not surprising to find the young New Englander who headed a charge in the grim Battle of the Wilderness and lay wounded for a week on the field, making his way to distinction in various lines of work requiring courage and ability, and to-day the president of one of the best known and most enterprising parent companies in the electric light business.

MISCELLANEOUS NOTES.

"Dirt Food."—The yarn that Mr. Edison was busy making food from dirt, to which we alluded lately proves, as was suggested, to have been a hoax, and to have been revamped from an article printed as far back as 1878.

Electrical Executions.—A bill favoring electrical executions is now before the Pennsylvania Legislature, introduced by Mr. S. Stevenson. The instrument of death is a chair, the invention of Mr. H. B. Sheridan, of New York, who has patented it, and will assign the right to use it to the State if the bill passes. The inventor does not propose to make money out of his device.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

H. Andres, 22 and 24 North Fourth street, Philadelphia.—The only genuine raw-hide goods made in the United States. Belting, lacing and straps of all kinds or hard raw-hide, lathes, planers, lubricators, fans, blowers, vacuum and steam pumps, cotton and leather belting, emery wheels and machinery of all kinds.

Woodhouse & Rawson Electrical Supplies.—We have just received the complete catalogue of the Woodhouse & Rawson Electrical Supply Company, London, which is published by them at the price of one shilling. This seems to be by far the most complete electrical catalogue that is published abroad. It not only gives the prices and full particulars of all the electrical supplies that are connected with Messrs. Woodhouse & Rawson's name, but we also notice the prices and details of most goods of well-known makers connected with electrical applications. The price list gives particulars of electric lighting and apparatus in connection with the same, such as steam and gas engines, turbines, etc., particulars of electric bells and signals, telephones, etc. This catalogue shows that English firms still mean to keep abreast as manufacturers. Probably not even America can show a more thoroughly and completely worked out price list.

Battery Circuit-Breakers.—The necessity has long been felt for a cheap and reliable circuit-breaker, to prevent the accidental grounding and consequent wasting of electric batteries used for gas lighting and other work. There is now ready for the market just such an instrument, made by the Electric Supply Company, of 3 Warren street, Syracuse, N. Y., which will forward a sample on application. It has no glass to be broken, no springs or adjustments to get out of order, and no clockwork to be kept wound and clean. In short, it never requires any attention whatever, and is sure in its action at all times.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

March 1, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	37
Am. Tel. & Cable	71½	73
Cen. & So. Am.	95	100
*Com. Tel	.....	.....
*Gold & Stock	93	.....
*Inter. Ocean Tel.	93	.....
N. Y. Mutual	70	74
Pac. & Atl.	47	54
*Postal T. & C.	30	35
South. & Atl.	60	.....
W. U. Tel.	73¾	73⅞
W. U. Scrip.	61	.....
W. U. Bonds	119	120
Mut. U. Bonds	85	86
TELEPHONE.		
Am. Bell	215	216
Am. Speaking	110	120
Erie	27¾	28
*Hudson River	60	65

TELEPHONE.	Bid.	Asked.
Mexican	1½	.....
*N. Y. & N. J.	90	93
N. Y. & Pa.	.....	.....
New England	43½	44
*Southern Bell	.....	150
ELECTRIC LIGHT.		
*Am. Electric	.....	.....
*Brush	90	110
*Brush Ill	50	.....
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	.....	195
*Edison Ill	95	107
*Edison Isolated	.....	.....
*United States	35	.....
*U. S. Ill	97	100
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED FEB. 15, 1887.

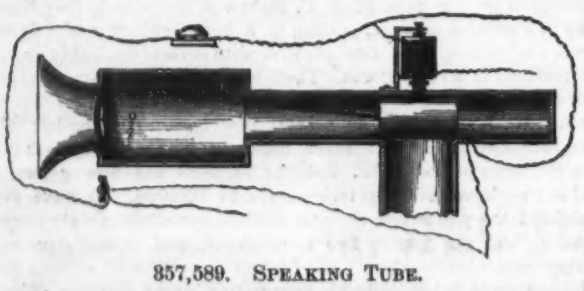
357,572. Electric Heater; W. L. Burton, Richmond, Va. Application filed April 23, 1886. Fine wires are surrounded with pulverized fire clay. The inventor finds that the clay enables the wire to carry a great current of electricity without melting. At the same time the clay becomes a heated body. [See illustration.]

(1) 357,576. Electro-Magnetic Brake; (2) 357,760. Circuit System for Electric Brakes; (3) 357,976. Car Brake; G. F. Card, Covington, Ky., Assignor to H. K. Lindsey, Cincinnati, Ohio. Application filed (1 and 2) July 6, 1886, (3) Dec. 26, 1885. These devices relate to brakes in which the momentum of the train is utilized to operate the brakes, whenever such momentum is thrown into action by an electric current. Peculiar electrical devices are employed in this service.

357,589. Speaking Tube; A. S. Fontaine, New York, N. Y. Application filed Oct. 22, 1885. This invention allows communication from one room to any other of a series, all connected on the same tube, without being heard in any room except in the one called. [See illustration.]

357,627. Cut-Out for Secondary Batteries; Geo. B. Prescott, Jr., Newark, N. J., Assignor to the U. S. Electric Lighting Co., of New York, N. Y. Application filed Nov. 7, 1885. This apparatus provides for the protection against injury to the battery or generator from the accidental or intentional lowering of the electromotive force of the generator, and connects and disconnects the generator and battery at the proper times.

357,642. Manufacture of Plates or Elements for Voltaic Batteries; Wm. H. Tasker, Tavistock Square, and Thos. J. Jones, Hanover Square, Assignors to the Primary Battery Co. (Limited), of Hanover Square, England. Applica-



357,589. SPEAKING TUBE.

tion filed Nov. 8, 1886. This invention consists, essentially in, a process of mixing together and molding, while in a dry state, the materials of which the plates are composed, and then steaming the mass while in the mold, whereby the soluble constituents of the mixture are dissolved and rendered active, so as to cause the mass to "set" or bind together in the mold, and at the same time leave interstices, which increase the porosity of the mass. [See page 121, this issue.]

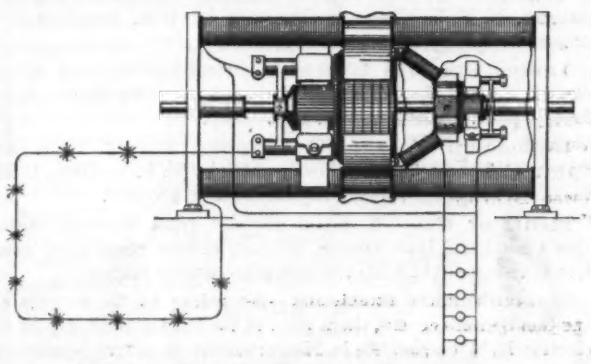
357,646. Galvanic Battery and Apparatus Connected Therewith; A. R. Upward, West Kensington, and C. W. Pridham, Kensington, England. Application filed Oct. 12, 1885. The battery is maintained in active condition by the passage of chlorine gas into the cells. The gas is supplied from a gas-holder of a special sort, and it is drawn through the battery by suction. [See THE ELECTRICAL WORLD, July 17, 1886.]

357,647. Sanitary Galvanic Appliance; Peter H. Vander Weyde, Brooklyn, N. Y. Application filed April 19, 1886. The appliance consists of a galvanic couple composed of a positive electrode of iron in place of zinc, as heretofore customary, and a suitable negative electrode adapted for contact with the skin, whereby the salts formed by electro-chemical action on the soluble electrode shall be non-poisonous.

357,682. Telephone Switch; J. W. McDonough and H. H. Eldred, of New York, N. Y. Application filed Aug. 16, 1884. An electric alarm, in circuit, is so arranged that if the user of the telephone shall hang it up without turning back the switch to normal position, the circuit of the alarm will be automatically completed by the hanging up of the instrument, and the person at hand will be thus advised of the neglect.

357,705. Dynamo Electric Generator; J. W. Easton, New York, N. Y. This machine is constructed to generate separate currents of greatly different potential, such for instance as are required on arc and incandescent circuits. [See illustration].

357,726. Electrical Circuit; J. F. Mehren, Chicago, Ill., Assignor to the Western Electric Co., same place. Application filed May 6, 1886. The invention relates to systems such as



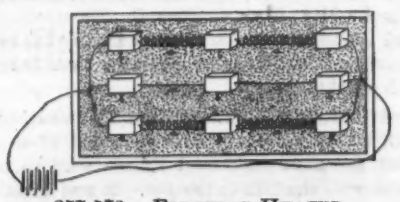
357,705. DYNAMO ELECTRIC GENERATOR.

fire alarm or telephone, in which there are several such systems branching from a central station. The invention provides for allowing stations on any of the systems to communicate with stations on one of the other systems.

357,774. Arc Lamp; V. Klán and F. Spurny, of Prague, Austria-Hungary. Application filed Dec. 16, 1885. The chief point in this invention is in suspending the carbon holders from two sets of pulleys, one for balancing the carbons by their weights, as usual, and the second set for maintaining them in equilibrium against the resultant attraction of the two solenoids by means of a suitably-suspended counterpoise.

357,789. Telegraph Sounder; R. C. Rutherford, Quincy, Ill. The idea is to provide a portable sounder which may be adjusted to give sounds which will enable the operator to hear the strokes at a distance or make the strokes so light that they can only be heard by applying the ear to the instrument.

357,815. Electric Burglar Alarm; E. E. Carr, Chalmers, Ind. Application filed June 1, 1886. The arrangement



357,572. ELECTRIC HEATER.

of the circuit and contacts and means for locating the break constitute the invention.

357,821. Multiple Switch-Board; W. S. Ford, Denver, Colo. Application filed July 6, 1886. The invention has for its chief object to provide means whereby the act of connecting two lines at any section of the switch-board will visually indicate at all the other sections the fact that the connecting lines are in use, and will also break the connection between the lines in use.

357,838. Electric Temperature Regulator; C. E. Lee, of Rochester, N. Y. Application filed Jan. 9, 1886. A thermostat controls an electro-magnet, which in turn directly controls a damper in the flue of a stove or furnace.

357,865. Electric Alarm and Signal Bell; S. H. Short, Denver, Colo., Assignor to the United States Electric Company, of same place. Application filed Oct. 12, 1886. This device is used principally on electric railways for giving an alarm to warn passengers at the station ahead of the approach of the train. Means are provided for ringing a bell on a closed circuit without in any way breaking the circuit while in operation.

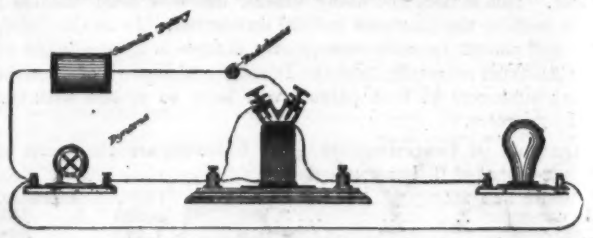
357,873. Device for Regulating the Flow of Electric Currents; E. T. Starr, Philadelphia, Pa., Assignor by mesne assignments to the Electrical Accumulator Co., of New York. Application filed Dec. 3, 1881. A regulating device is provided which prevents the lines from becoming overcharged and consequently overheated, to the end that fires may be prevented. [See illustration.]

357,881. Electric Railway Signal; E. D. Wells, Westminister, Md. Application filed Nov. 20, 1886. The railroad is divided into sections, and the invention consists in the peculiar construction and arrangement of the circuit, contacts and signaling mechanism, whereby one train is automatically signaled and prevented from entering one section of track until the train on that section has passed off the same.

357,885. Electric Clock System; T. J. Zoeller, Louisville, Ky. Application filed Sept. 30, 1886. The inventor designs to provide devices whereby the line connecting a series of clocks will remain in operation should a break occur at any time.

357,922. Electrical Signal Service; Wm. Hand, of Hamilton, M. C. Wright and Francis A. Pocock, of Toronto, Canada. Application filed Feb. 27, 1886. Signals are placed along a railroad, which may be fired by electricity by a station agent at a distance, in case the trains are running irregularly and liable to collide.

357,960. Electric Fire Alarm; W. L. Horne, Meriden, Conn. Application filed July 12, 1886. The chief design of this invention is to provide an alarm for buildings in which the alarm is sounded in a certain order through the rooms so as to



357,873. CURRENT REGULATOR.

give the occupants of the building a chance to escape without a stampede and crowding at the escapes.

357,967. Mechanical Telephone; C. M. Radford, of Concord, N. H., Assignor, by mesne assignments to the Popular Telephone Co., of same place. Application filed March 30, 1886. The invention consists in means for adding power within the telephone transmitter, and for avoiding any liability of tearing the button on the line wire through the parchment diaphragm.

357,995. Mechanical Telephone; J. H. Howard, Boston, Assignor to R. C. Elliott, trustee, of Somerville, Mass. Application filed Feb. 24, 1885. This invention provides for regulating the tension of the wire, for insulating the wire, for signaling, for varying the inclination of the diaphragm, and for muffling the wire to prevent transmission of external sound.

358,002. Electric Amalgamator; T. H. Trauernicht, Lead City, Dakota. Application filed Jan. 1, 1886. An iron plate is located in the washing pan in close proximity to the crushed ore. Portions of this plate are successively magnetized and demagnetized, first attracting the iron particles to one portion and then to another, and so on till the particles are led off from the pan.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.